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Prepared For:

GENERAL DYNAMICS

FEBRUARY 1980

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COMMERCIAL PRODUCT OPPORTUNITIES

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I INTRODUCTION

I INTRODUCTION

A. PROJECT OBJECTIVES

- The objective of this project is to access commercial market opportunities for selected data processing related products and/or services available from General Dynamic's Central Data Systems Center (CDSC) at Ft. Worth, Texas.

B. METHODOLOGY

- GD and INPUT agreed to examine briefly a number of potential product/service candidates, and then to select four or five for field research by INPUT.

- INPUT spent several days with GD CDSC personnel reviewing 29 different candidates (See Exhibit I-1).

- Based on this initial review, INPUT then provided GD with written comments concerning its relative market potential, and thus attractiveness for further research via field interviews. Criteria used by INPUT for this initial screening process included:

  - Degree of "value added" to the product by GD.

  - Unique strengths of GD.

EXHIBIT I-1

PRODUCTS REVIEWED AS POTENTIAL MARKET RESEARCH CANDIDATES

CATEGORY	PRODUCT/SERVICE REVIEWED
CAD/CAM	ROBOTICS CNC/DNC PHOTOGRAMMETRY CAUIS COORDINATE MEASURING MACHINE AUTOMATED ELECTRIC HARNESS CONSULTING CUSTOM DEVELOPMENT COMPUTERIZED GRAPHICS SERVICE
MANUFACTURING PLANNING AND CONTROL	AUTOMATED PLANNING F16 WORLDWIDE SCHEDULING PLANNED VALUE CENTRALIZED CALIBRATION SYSTEM MANUFACTURING WORK IN PROCESS VENDOR DOCUMENTS VOCOL II WORLDWIDE PARTS TRACKING PARTS TRACKING INSPECTION PLANNING SYSTEM ELECTRONIC FABRICATION SUPPORT SYSTEM LOGISTICS INTEGRATED SUPPORT SYSTEM MANAGEMENT SCIENCE CONSULTING CORAL
SYSTEMS SOFTWARE AND DEVELOPMENT	TANDEM SYSTEMS SOFTWARE SES SES ORIENTED SOFTWARE TRAINING NETWORK OPERATOR SOFTWARE
OTHER	FINANCIAL PLANNING AUTOMATED TECHNICAL PUBLICATIONS

  - Product reinforcement of GD corporate strategy.

  - Estimated relative market size.

  - Anticipated competition.

- After weighing INPUT's comments with other internal considerations, GD selected the following items for inclusion in the field research:

  - Computerized graphics services.

  - Tandem systems software.

  - Management science consulting.

  - Network operator software.

- In addition, GD requested INPUT to survey "unmet manufacturing systems needs." This information is to assist GD in identifying other internal resources and skills which, if marketed, would fulfill important customer requirements.

- INPUT then designed questionnaires, selected population samples and conducted field research.

- Fifty interviews were completed for this project (10 on-site and 40 telephone). See Appendix A for a description of interview characteristics by product or service.

- INPUT then analyzed the interview results and combined that information with its own knowledge of the characteristics of the marketplace. This report is the result of that analysis.

- Financial forecasts included in this report are based on constant U.S. dollars in order that GD might see the actual year-to-year changes due solely to marketplace developments.

- A definition of terms is included in Appendix B.

- Examples of the questionnaires used for the field interviews are shown in Appendix C through H.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. OVERVIEW OF MARKET OPPORTUNITIES

I. COMPUTERIZED GRAPHICS SERVICE

- Of the products selected for the study, Computerized Graphics Services (CGS) offers the greatest market opportunity for GD.

    - The Ft. Worth-Dallas annual market potential is large and growing ($2.9 million in 1980, rising to $12.2 million by 1984).

    - Competition is light.

    - GD annual revenue potential increases from a base of $100,000 in 1980 to $5 million by 1984 (see Exhibit II-1).

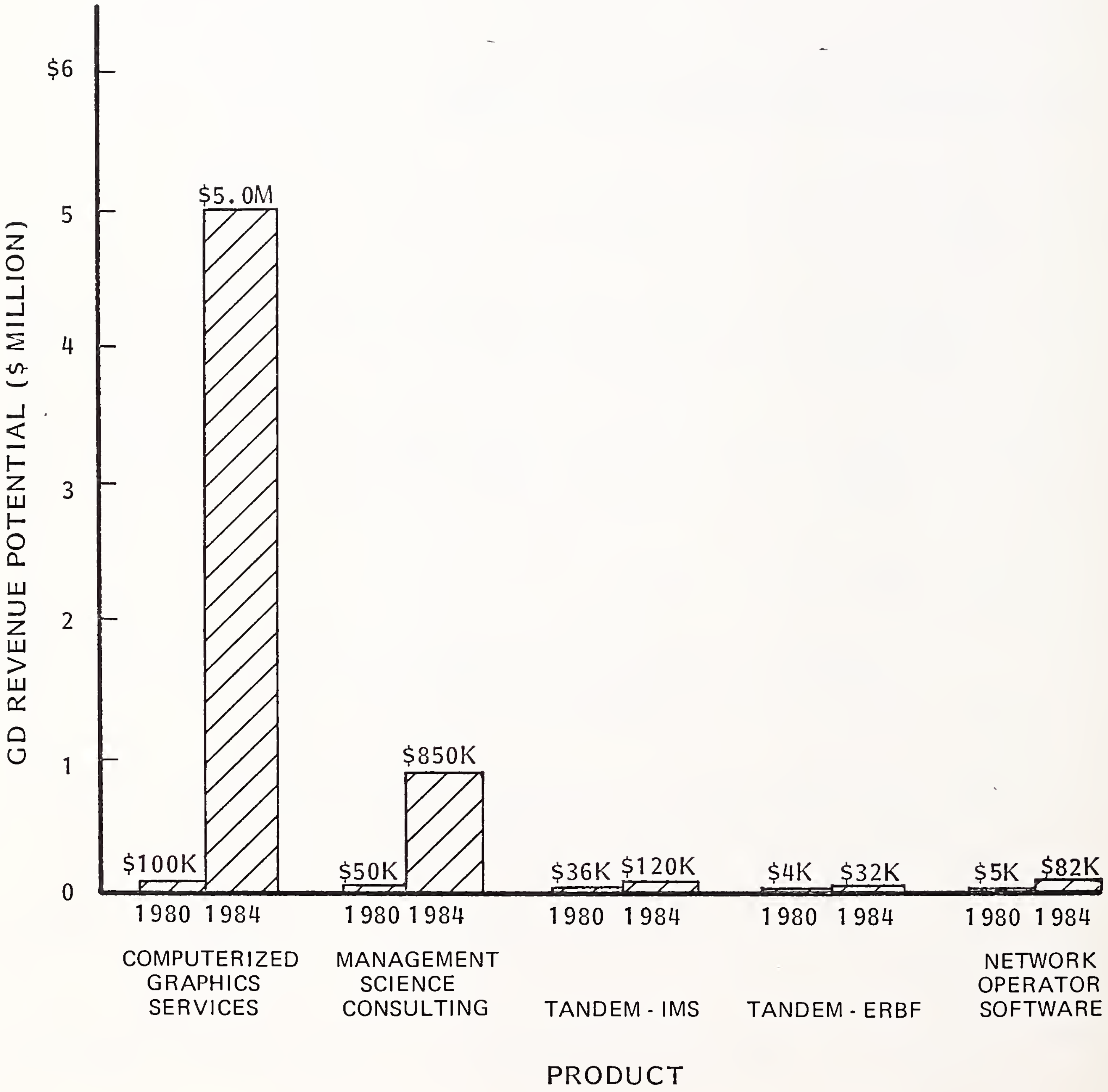
- Marketing must be persistent. Staffing challenges exist. However, the market is ripening, the timing is good. Acquisition opportunities may exist.

- INPUT recommends GD seriously consider CGS as a major new business venture opportunity.

- A marketing strategy with the following characteristics should be considered:

EXHIBIT II-1

ANNUAL GD PRODUCT REVENUE POTENTIAL (1980, 1984)



- Offer drafting, not design services.

- Provide operators as well as the hardware and software.

- Place primary focus on customers within 50 miles of the service. Place secondary emphasis on customers from 50 to 100 miles away. Do not expect many customers beyond this distance due to the logistics and time delay of document transportation.

- Expect primarily non-dimensional and/or repetitive type of drawings (e.g., schematics, flow diagrams, multi-story building and/or apartment plans).

- Seek to establish a competitive edge by specializing in specific types of drawings and customers.

- Focus on selling large companies with good volume potential (e.g., $5,000 per month per customer and up).

- Key issues to be resolved regarding CGS market entry by GD include:

  - Selection of a specialty area that matches local prospect needs.

  - Staffing for as much first shift capability as possible.

- These issues are challenges well worth resolving.

2. MANAGEMENT SCIENCE (MS) CONSULTING

- Management Science Consulting is a good sized growth market. The annual revenue potential for GD is $50,000 by 1980 and $850,000 by 1984. (See Exhibit II-1). However, INPUT recommends that GD not make a major business commitment to Management Science Consulting as a purely manpower oriented service.

- Major factors entering into this recommendation include:
  - Competition is extensive, and in many cases, well entrenched.
  - GD management science consulting capabilities currently appear to be totally labor intensive. No support product (e.g., proprietary software and/or data base) exists to help improve margins.
  - A considerable marketing effort must be devoted to selling the need at high levels in a prospect's organization.
- Should GD identify a software support product and/or proprietary data base that would logically support management science consulting expertise, then the question of market attractiveness should be reexamined. Such a strategy might be viable if:
  - A area of specialization is identified that fits with strong market interest.
  - Having a software and/or data base product is a large part of the value added. It allows the establishment of an important competitive edge, as well as increasing the profit margin potential.
- A strategy of this type should be considered when targeting companies with sales under $500 million. These firms are less likely to have in-house expertise.

3. TANDEM SYSTEMS SOFTWARE

- Good market interest exists for Tandem Systems Software, especially for the Tandem-IMS Interface. However, INPUT recommends that GD not market these programs directly. The Tandem-IMS Interface should be offered to an established software products vendor for marketing and support, in exchange for royalty payments to GD.

- The Tandem Enhanced Remote Batch Facility (Tandem-ERBF) and Tandem Audio-Response Interface should not be developed using marketing revenues as a partial justification. Their markets are too small and costly to enter.

- Reasons for INPUT"s recommendations include:

  - GD's annual revenue potential in this market is very small. Tandem-IMS and Tandem-ERBF combined are $40,000 for 1980, and $152,000 for 1984 (Exhibit II-1).

  - Future GD revenues are highly dependent on Tandem Computer's ability to sell hardware in an increasingly competitive market.

  - Significant enhancements may be required.

  - Setting up and managing a software products organization on this small a revenue base will be very costly and time consuming.

4. NETWORK OPERATOR SOFTWARE

- The Network Operator Software (NETOP) should not be marketed as it now exists.

  - Prospect interest is high, but IBM has two very low priced products ($100 to $125 per month per package) which dominate the market.

  - The overall market is not large. GD annual revenue potential is $5,000 by 1980 and $82,000 by 1984. (See Exhibit II-1.)

  - Reliability and support demands by customers will be high since the product performs a sensitive function within a complex network environment.

5. UNMET MANUFACTURING SYSTEMS NEEDS

- Respondents surveyed had many different opinions regarding unmet needs. However, the following areas were mentioned more often than others:

  - Inventory management.

  - Improvement of worker commitment, skills, and availability.

  - Control over people costs.

  - Robotics.

- Manufacturing systems selected for implementation appear to be shifting from a past emphasis on machine and material control to a current emphasis on people cost control.

- INPUT believes that GD's unique expertise in robotics may offer a major product opportunity. Marketing robotic enhancements may not only bring GD significant revenues, but perhaps even more importantly, bring GD a continuous stream of additional ideas and knowledge on robotics improvements. This information, which is difficult to acquire otherwise, can then be fed back into GD for additional productivity payoffs. Should GD decline to enter the robotics marketplace, others undoubtedly will. In that case GD would lose both the revenues and the knowledge feedback.

B. ADDITIONAL CONSIDERATIONS

- INPUT suggests GD also investigate the following product candidates for market potential:

  - A product to allow large non-IBM mainframes to access IMS data bases.

  - A computer workload forecasting model sufficiently generalized to allow a variety of large firms to better predict computer capacity requirements.

- Today's data processing services marketplace is highly competitive. Two key factors which are required for success, regardless of which type of product is offered, are (1) commitment to the business opportunity on a full time basis, and (2) continual emphasis on marketing.

III COMPUTERIZED GRAPHICS SERVICE

III COMPUTERIZED GRAPHICS SERVICE

A. INTRODUCTION

1. PRODUCT DESCRIPTION

- A computerized graphics (CG) service offers computer-aided design (CAD) hardware, software, and personnel to external clients. Based on GD's existing resources, such a service might provide CADAM and/or Computervision capabilities.

- Clients using this service receive the benefits of automated drawing production without the necessity of investing in the equipment and/or operator training.

2. INTERVIEW PROFILE

- Thirteen firms were interviewed for this portion of the survey. Eleven were service users or potential users, while two were service vendors.

- Exhibit III-1 profiles the characteristics of the eleven non-vendor respondents. Firms interviewed ranged in size from a $2 million architect/engineering firm to a $2.6 billion manufacturer. Eighteen percent of the respondents were

EXHIBIT III-1

RESPONDENT PROFILE - COMPUTERIZED GRAPHICS SERVICE SURVEY

CATEGORY	RESPONDENT					
	1	2	3	4	5	6
SALES ($ MILLION)	$2,000	$200	$5	$2	$140	$1,368
INDUSTRY	MFR.	ENGR.	ARCH./ ENGR.	ARCH./ ENGR.	MFR.	UTILITY
LOCATION	NEW JERSEY	PHIL.	FORT WORTH	FORT WORTH	FORT WORTH	DALLAS
DRAWINGS PER MONTH	100	600	90	75	200	12+
COMPUTERIZED GRAPHICS USAGE	SERVICE	SERVICE AND IN-HOUSE	NONE	NONE	NONE	NONE

(CONT.)

CATEGORY	RESPONDENT				
	7	8	9	10	11
SALES ($ MILLION)	$75	$50	$4	$2,600	$2,000
INDUSTRY	ENGR.	ARCH./ ENGR.	ENGR.	MFR.	ENGR.
LOCATION	DALLAS	HOUSTON	DALLAS	FORT WORTH	HOUSTON
DRAWINGS PER MONTH	400	1,000	350	100	12+
COMPUTERIZED GRAPHICS USAGE	NONE, evaluating in-house	IN-HOUSE	IN-HOUSE	IN-HOUSE	IN-HOUSE

users of a computerized graphics service, 42% had in-house capabilities, while the remainder (42%) did not use computerized graphics of any kind.

- Exhibit III-2 summarizes these firms in terms of their size and primary business activity.

- Eight of the eleven were selected with no prior knowledge of their usage of computerized graphics. Two service users and one in-house user were chosen specifically to provide insight into the attitudes of those firms actively using computerized graphics.

- Nine of the eleven firms are located in Texas.

- Respondents were either high level engineering managers (46%), managers of drafting services (36%), or managers of related engineering/drafting activities (18%).

B. MARKET CHARACTERISTICS

1. PRODUCT INTEREST

- Of the eight respondents surveyed with no prior knowledge of their usage of computerized graphics, three (38%) had in-house systems, while 62% used neither a service nor in-house facilities.

- Of the three in-house users, two were engineering firms and one was a manufacturer.

- One hundred percent of the respondents claimed they were "familiar" with the concept of computerized graphics. Serious usage of CG has been considered by 82% of those surveyed.

EXHIBIT III-2

RESPONDENT PROFILE ANALYSIS - COMPUTERIZED GRAPHICS SERVICE SURVEY

CATEGORY	TOTAL RESPONDENTS	
	PERCENT	NUMBER
SALES		
OVER $500 MILLION	37%	4
$100-$500 MILLION	18	2
$10-$99 MILLION	18	2
UNDER $10 MILLION	27	3
TOTAL	100%	11
INDUSTRY		
ENGINEERING	46%	5
ARCHITECT/ENGINEERING	18	2
MANUFACTURING	27	3
UTILITY	9	1
TOTAL	100%	11

- Degree of interest in computerized graphics services was varied. Twenty-two percent of the respondents not currently using a service indicated a medium interest (Exhibit III-3), while 45% reported a low interest and 33% specified "none".

- Those with in-house systems had less interest in a service than those with no CG facilities (100% of the in-house users reported low or no interest in CGS).

- None of the respondents expressed a high interest in using a computerized graphic service.

- Of those with in-house equipment, all used standalone systems rather than one tied to a large mainframe computer. Systems in use were Auto-Trol (two respondents), Adage (one), Applicon (one), and Tektronic 4051 (one).

- A correlation exists in the survey sample between volume of drawings produced per month and usage of computerized graphics. As shown in Exhibit III-4, none of the companies with less than 100 drawings per month used computerized graphics. In contrast, 100% of those firms producing over 500 drawings per month had automated this function to some degree. Those companies in the mid-range of drawing volume (100 to 500 per month) were divided (60% had automated, while 40% had not).

- No correlation was found between computerized graphics usage and anticipated increases in drawing production over the next 12 months.

- Similarly, no correlation was found between automation activity and usage of drawings as input to other systems. Forty percent of the respondents reported the presence of such an interface, but their usage of computerized graphics was no different than the sample as a whole.

- However, companies which experience a 20% or more fluctuation in number of design engineers and draftsmen over a 12 month period, were almost twice as likely to use computerized graphics of some kind (Exhibit III-5). Seventy-five

EXHIBIT III-3

RESPONDENT INTEREST IN COMPUTERIZED GRAPHICS SERVICE

CURRENT USAGE OF COMPUTERIZED GRAPHICS	DEGREE OF INTEREST IN A SERVICE				
	HIGH	MEDIUM	LOW	NONE	TOTAL
NONE	0% (0)	40% (2)	40% (2)	20% (1)	100% (5)
IN-HOUSE	0% (0)	0% (0)	50% (2)	50% (2)	100% (4)
TOTAL	0% (0)	22% (2)	45% (4)	33% (3)	100% (9)

( ) = NUMBER OF RESPONDENTS

EXHIBIT III-4

RESPONDENTS' USAGE OF COMPUTERIZED GRAPHICS BY DRAWING VOLUME

NUMBER OF DRAWINGS PRODUCED PER MONTH	TYPE OF COMPUTERIZED GRAPHICS IN USE				
	Ⓐ SERVICE	Ⓑ IN-HOUSE	Ⓒ SUBTOTAL (Ⓐ + Ⓑ)	Ⓓ NONE	Ⓔ TOTAL (Ⓒ + Ⓓ)
UNDER 100	0% (0)	0% (0)	0% (0)	100% (3)	100% (3)
100 TO 500	20% (1)	40% (2)	60% (3)	40% (2)	100% (5)
OVER 500	50% (1)	50% (1)	100% (2)	0 (0)	100% (2)
AVERAGE ALL RESPONDENTS	20% (2)	30% (3)	50% (5)	50% (5)	100% (10)

( ) = NUMBER OF RESPONDENTS

EXHIBIT III-5

MANPOWER FLUCTUATION AND COMPUTERIZED GRAPHICS INTEREST

DOES NUMBER OF DESIGN ENGINEERS AND DRAFTSMEN FLUCTUATE OVER 20% PER YEAR?	DEGREE OF INTEREST IN COMPUTERIZED GRAPHICS SERVICES				
	HIGH	MEDIUM	LOW	NONE	TOTAL
YES	– (0)	33% (1)	33% (1)	34% (1)	100% (3)
NO	(0)	17% (1)	50% (3)	33% (2)	100% (6)
AVERAGE OF MENTIONS	(0)	22% (2)	45% (4)	33% (3)	100% (9)

DOES NUMBER OF DESIGN ENGINEERS AND DRAFTSMEN FLUCTUATE OVER 20% PER YEAR?	TYPE OF COMPUTERIZED GRAPHICS NOW USED				
	SERVICE	IN-HOUSE	SUBTOTAL	NONE	TOTAL
YES	25% (1)	50% (2)	75% (3)	25% (1)	100% (4)
NO	14% (1)	29% (2)	43% (3)	57% (4)	100% (7)
AVERAGE OF MENTIONS	18% (2)	37% (4)	55% (6)	45% (5)	100% (11)

percent of those with such fluctuations were using either an in-house or service-based CG, whereas only 43% of those with less fluctuation were doing so.

- Exhibit III-6 indicates that companies with a great deal of the following drawing characteristics tend to use computerized graphics more:

  - Standard components (repetitive drawings).

  - Changes to existing drawings.

  - Drawings usually not complex.

- Two non-service user respondents reported that the best type of drawings for production by a computerized graphics system are repetitive drawings where a few details must be changed (e.g., floor plans for a 20 story building, or for a 100 unit apartment).

- Both service users and service vendors stated that the best type of drawings for a service vendor are non-scale, non-dimensional drawings (e.g., process flow diagrams, schematics, etc.).

2. BENEFITS

- Respondents view computerized graphics primarily as a drafting rather than a design automation tool. Although several individuals from companies using computerized graphics indicated a desire to automate more of the design function, they viewed that objective as slow to be realized.

- When asked to rank the value of four proposed benefits, non-service users (i.e., those with either in-house graphics or none at all), selected "design personnel productivity" as the most important (Exhibit III-7). However, they believed

EXHIBIT III-6

COMPUTERIZED GRAPHICS USAGE BY CHARACTERISTICS OF DRAWINGS

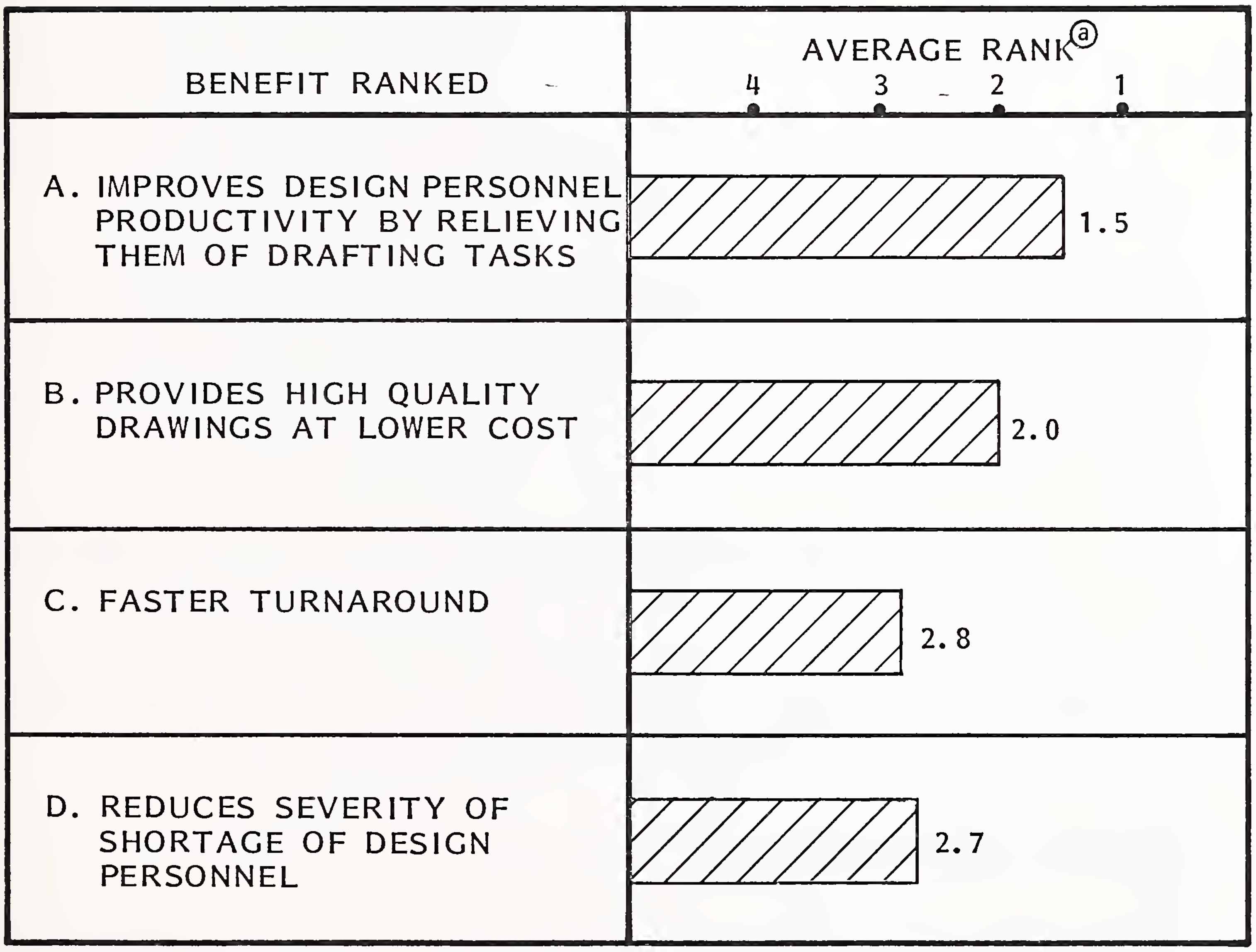
CHARACTERISTICS OF DRAWINGS	PERCENT ANSWERING "OFTEN"		
	USING COMPUTERIZED GRAPHICS? ①		
	YES (5)	NO (5)	TOTAL (10)
CLOSE TO SCALE	80%	100%	90%
STANDARD COMPONENTS	80%	40%	60%
COMPLEX	0%	60%	30%
MODIFICATIONS	40%	0%	20%
HAND LETTERING	40%	60%	50%
MILITARY STANDARDS	0%	20%	10%
3 DIMENSIONS	0%	0%	0%

① EITHER SERVICE OR IN-HOUSE

( ) = NUMBER OF RESPONDENTS

EXHIBIT III-7

COMPUTERIZED GRAPHICS BENEFIT RANKING: NON-SERVICE USERS



ⓐ RANK: 1 MOST IMPORTANT 3 THIRD NEXT IMPORTANT
2 NEXT MOST IMPORTANT 4 LEAST IMPORTANT

OTHER BENEFITS CITED
• "FREES UP OFFICE SPACE, FURNITURE." • "HIGHER UTILIZATION OF IN-HOUSE PERSONNEL." • "GOOD AS MARKETING TOOL FOR CLIENTS."

that the payoff came from relieving design people of drafting tasks, not by using the computer to do design work.

- The second ranked benefit was "provides high quality drawings at lower cost." Several respondents emphasized that the quality of the drawing itself, in terms of clarity, was noticeably improved by computerized graphics.

- Faster turnaround was ranked third in terms of value.

- Exhibit III-8 lists the benefits of a computerized graphics service as cited by the service users interviewed for the survey.

- Generally, the benefits reported by the two service respondents conformed to the benefits specified by non-service users. Both mentioned the better utilization of existing people, reduction of pressure on office space, and the marketing value of this tool.

  - One of the service users emphasized that using an outside vendor was a good stop-gap measure until in-house equipment was available.

- Vendors themselves perceive the main benefits of their service to be (1) quality, (2) fast turnaround, and (3) cost effectiveness.

3. OBJECTIONS AND CONCERNS

- When asked about objections and concerns that the respondent's firm might have to the usage of a computerized graphics system of any kind, the responses included:

  - Cost (two mentions).

  - Must keep machine busy two shifts to pay for it.

  - Older employee resistance.

EXHIBIT III-8

BENEFITS CITED BY COMPUTERIZED GRAPHICS SERVICE USERS

- "HELPS REDUCE SCARCITY OF DRAFTSMEN." (2 MENTIONS)
- "USES FEWER PEOPLE."
- "RELIEVES OFFICE SPACE PROBLEMS."
- "HAS MARKETING APPEAL TO OUR CLIENTS."
- "A LITTLE LESS COSTLY."
- "GOOD STOP-GAP UNTIL WE GO IN-HOUSE

    - Space requirements.

    - Disruption of work by training.

- Objections and concerns about usage of a vendor supplied computerized graphics service included:

    - Slow turnaround time (two mentions).

    - Loss of in-house control (two mentions).

    - Distance to vendor.

    - No graphics operator communication.

    - Loss of security.

    - Vendor usage of different drawing symbols.

    - Amount of start-up time required.

- The above concern about slow turnaround was interesting in view of the vendors belief that one of their main benefits was fast turnaround!

C. SERVICE VENDORS

1. VENDORS MENTIONED

- According to respondents there are a number of computerized graphics services vendors in many of the larger metropolitan areas of the country, especially on the East Coast.

- Vendors mentioned by name during the survey are listed in Exhibit III-9.

- Clients of both Master Design and N.P.S. were interviewed for this survey.

2. VENDOR CHARACTERISTICS

- Exhibit III-10 compares the characteristics of the two vendors interviewed. They are similar in the following respects:

  - Sales volume ($700-750 thousand).

  - Expected growth rate for 1980 (15-25%).

  - Use of standalone graphics systems.

  - Size of average job ($1,000-2,000).

  - Pricing basis ($50-60 per hour).

  - Main indirect competition: in-house systems.

  - Best market segment for growth: small to medium size companies.

- Differences between the two vendors primarily center on the characteristics of their typical customers. Vendor #1 focuses on $1+ billion dollar process manufacturing and engineering firms, while vendor #2 targets $10-15 million electronic firms.

- Vendor #1 found billion dollar firms easiest to sell because they are familiar with the concept of computerized graphics. These firms tend to use the service vendor as backup for their in-house systems.

EXHIBIT III-9

SERVICE VENDORS MENTIONED

VENDOR	LOCATION
AUTOMATED IMAGES	BOSTON
COMPUTING DRAFTING	NEW JERSEY
COMPUGRAPHICS	PHILADELPHIA
DIGITAL GRAPHICS	FORT LAUDERDALE AND OTTAWA
MASTER DESIGN	MORRISTOWN, NJ.
N.P.S. (NUCLEAR POWER SERVICE)	HOUSTON AND SECAUCUS, NJ.
TRIAD	BURLINGTON

EXHIBIT III-10

SERVICE VENDOR CHARACTERISTICS

CHARACTERISTICS	VENDOR	
	1	2
ANNUAL SALES ($000)	$700	$ 750
1980 SALES ESTIMATE ($000)	$910	$1,000
1984 SALES ESTIMATE ($000)	N.A.	$5,000 (2 LOCATIONS)
LOCATION	EAST COAST	EAST COAST
YEARS IN BUSINESS	4 YEARS	2 YEARS
NUMBER OF EMPLOYEES*	35	N.A.
EQUIPMENT USED	COMPUTERVISION CALCOMP AUTO-TROL	APPLICON 875 WITH 3 TERMINALS AND PHOTO PLOTTER
NUMBER OF CUSTOMERS	25 CURRENTLY 70 TO DATE	80-100: AVERAGE 50-80 ORDERS/MONTH
TYPICAL CUSTOMERS	$1B+ CHEMICAL, PETROCHEMICAL, ENGINEERING FIRMS	$10-15M ELECTRONIC COMPANIES
TYPICAL TYPES OF DRAWINGS PRODUCED	PROCESS FLOW; SCHEMATICS	PRINTED CIRCUITS; MICROELECTRONIC ARTWORK FOR TOOLS; SCHEMATICS
PRICING	$50-60/HOUR FTA = 150%	FIXED PRICE BASED ON $60 PER HOUR PLUS PLOT CHARGE
BILLING FOR AVERAGE JOB	$1-2,000	$1,500
BEST SEGMENT FOR GREATEST FUTURE GROWTH	SMALL TO MEDIUM SIZE COMPANIES (WILL TAKE MUCH CULTIVATING)	SMALL TO MEDIUM SIZE COMPANIES (ABOUT 15 EMPLOYEES)
MAIN INDIRECT COMPETITION	IN-HOUSE SYSTEMS	IN-HOUSE SYSTEMS

CODES:
N.A. = NOT AVAILABLE
FTA = FAST TURN-AROUND
*MAY INCLUDE PART-TIME EMPLOYEES

- When asked what they consider their competitive edge, one vendor specified reliability and willingness to offer fixed prices. The other vendor emphasized "reputation within our geographical area."

- Both vendor respondents believed that growth was ahead for them. One vendor indicated that because of the uncertainty of the economy, firms will prefer a variable cost in the form of a service vendor rather than hiring additional personnel to meet seasonal peaks. The success of computerized graphics trade shows on both the East and West Coasts was viewed as encouraging.

- In regards to key marketing challenges for the future:

    - Vendor #1 stated that "establishing confidence" was the main challenge. They try to get a foot in the door by doing smaller jobs, and then build their reputation from there.

    - Vendor #2 believed that the biggest problem was finding the "right application." They lose money on large printed circuit boards as more data is involved, and the machine slows down. They also prefer to avoid mapping applications as the data base is huge, the machine is slow, and the market is "not there".

- The service vendor respondents identified the following approaches to sales promotion:

    - Exhibit at shows.

    - A lot of personal selling.

    - Direct mail.

- One vendor had tried to advertise in trade magazines and was disappointed with the results. The other vendor will begin this type of advertising in March for the first time.

D. SERVICE USER PROFILE

1. COMPARISON

- Exhibit III-11 profiles some key characteristics of the two service users interviewed for this survey.

- Both users are large East Coast companies.

- Both are spending thousands of dollars per month for computerized graphics services.

- User #1 anticipates its service usage will increase in 1980.

- User #2 views the service vendor as strictly a stop-gap measure until they are able to do all work in-house. Thus, a decrease in service usage is forecast for 1980.

2. EVALUATION AND BUYING METHODS

- Prospective users like to try the service vendor on a test basis before committing a significant amount of work.

- Evaluation of service vendors was done by individuals with titles such as "Manager, Design Engineering" and "Vice President/Manager of Operations." The final decision was made by top engineering executives.

EXHIBIT III-11

SERVICE USER CHARACTERISTICS

	SERVICE USER RESPONDENT	
CHARACTERISTICS	1	2
SALES ($ MILLION)	$2,000	$200
INDUSTRY	MANUFACTURER	ENGINEERING
LOCATION	NEW JERSEY	PHILADELPHIA
DRAWINGS PER MONTH	100	600
VENDOR	MASTER DESIGN N.P.S.	MASTER DESIGN
FIRST USED VENDOR	7 MONTHS AGO	2 YEARS AGO
SPEND PER MONTH WITH VENDOR	$10-15,000/MONTH	$5-10,000/MONTH
PLANNED SERVICE USAGE IN 1980	COULD INCREASE TO $30,000/MONTH	WILL DECREASE: GOING IN-HOUSE
OVERALL SATISFACTION	VERY SATISFIED	SOMEWHAT SATISFIED

- When asked how they justified the usage of the service vendor, one user replied, "quite easily - cost never was an objection." The other respondent indicated that to justify the cost of an in-house system you must keep a four to five workstation system busy 16 hours per day at a productivity rate of 3 to 1 (i.e., one machine operator does the work of three draftsmen). This is the break even rate. He implied these economics helped determine when it was and was not attractive to use a service vendor.

- The manufacturing respondent indicated that its relationship with its vendors was not a contractual one.

- When asked what additional capabilities they would like a service vendor to offer that are not currently being offered, one user replied "have the vendor located closer to our company." The other user expressed a desire to have access to a combined service of design and drafting. The respondent admitted delivering such a service may be difficult because it requires tight scheduling to match the two activities.

E. MARKET ANALYSIS

1. MARKET SIZE AND GROWTH

- The potential market for computerized graphics services in the U.S.A. is estimated to be $220 million in 1979 (Exhibit III-12). This will grow to $1.2 billion by 1984. (The actual revenues received by service vendors in the U.S.A. during 1979 is estimated to be $18 million, or about 8% of the potential market.)

- The potential market for services in the Ft. Worth-Dallas area is $2.2 million for 1979, and $12.1 million for 1984. This is based on the following assumptions:

EXHIBIT III-12

MARKET SIZE AND GROWTH - COMPUTERIZED GRAPHICS SERVICE

($ MILLION)

ANNUAL SALES	1979	1980	1981	1982	1983	1984
IN-HOUSE SYSTEMS:① - USA	$275	$365	$531	$754	$1,071	$1,510
SERVICES: - U.S.A.② (POTENTIAL)	220	292	425	603	857	1,208
SERVICES: - FT. WORTH & DALLAS③ (POTENTIAL)	2.2	2.9	4.3	6.0	8.6	12.1
SERVICES: - AVAILABLE TO GD④ (POTENTIAL)	-	1.4	2.1	3.0	4.3	6.0
SERVICES: - AVAILABLE TO GD (POSSIBLE)	-	0.1⑤	1.0	2.0	3.5	5.0

① SOURCE: MERRILL LYNCH RESEARCH DIVISION

② 80% OF IN-HOUSE SYSTEM SALES

③ 1% OF U.S.A. SERVICES SALES

④ 50% OF FT. WORTH-DALLAS MARKET AFTER 1980

⑤ DUE TO START-UP CONSTRAINTS

- In-house systems had, by 1979, penetrated only three percent of their estimated potential market on a national basis.

- Services are expected to capture a market at least 80% as big as the in-house market.

- The Ft. Worth-Dallas market is estimated to be 1% of the U.S. market.

- INPUT believes that because the Ft. Worth-Dallas market is currently devoid of any significant competition, GD has an opportunity, if it moves quickly and aggressively, to capture 50% of this market eventually.

- For the next two years start-up constraints, not market availability, will be the limiting factor in terms of GD revenue potential in this area. For this reason, a GD Ft. Worth-Dallas revenue potential of $0.1 million is estimated for 1980, and $1.0 million for 1981. By 1984, possible GD revenue is $5.0 million.

2. KEY FACTORS

- Key factors affecting the market opportunity for a computerized graphics service are summarized in Exhibit III-13. Factors which are encouraging from a marketing opportunity point of view are placed under the "Pro" column. Factors which tend to add risk, uncertainty, and/or a high level of expense are listed under the "Con" column.

- The market for computerized graphics systems and services is an active and growing one. Over 800 in-house standalone systems are estimated to be installed in 1980. In Houston alone, almost two dozen firms have acquired such systems.

- Service vendors are active and growing. INPUT estimates there are currently at least two dozen firms in the U.S.A.

EXHIBIT III-13

MARKET OPPORTUNITY FACTORS - COMPUTERIZED GRAPHICS SERVICE

PRO	CON
A. MARKET EXISTENCE 1. 38% HAD IN-HOUSE SYSTEMS 2. CG SERVICE VENDORS ACTIVE 3. 82% SERIOUSLY CONSIDERED CG USAGE IN PAST	A. MARKET EXISTENCE 1. 22% HAD MEDIUM INTEREST IN CG SERVICE
B. MARKET GROWTH 1. CG HARDWARE SALES GROWING 40%+ ANNUALY 2. CG SERVICE VENDORS ACTIVE AND GROWING	B. MARKET GROWTH 1. SOME SERVICE USERS PLAN TO GO IN-HOUSE EVENTUALLY 2. ONLY CERTAIN APPLICATIONS WILL FIT
C. OPPORTUNITY FACTORS 1. SERVICE VENDORS SMALL, LESS FINANCIALLY STABLE 2. LOW VENDOR ACTIVITY IN FORT WORTH - DALLAS 3. LARGE REVENUE POTENTIAL 4. FITS GD SKILLS, EXPERTISE 5. ACQUISITION OPPORTUNITIES 6. LEVERAGE GD SOFTWARE SKILLS	C. OPPORTUNITY FACTORS 1. PROXIMITY TO CLIENT IMPORTANT 2. LONG SALES CYCLE DUE TO NEWNESS OF THE APPLICATION 3. FIRST SHIFT OPERATION DESIRABLE

CODES: CG = COMPUTERIZED GRAPHICS SERVICE

- Another positive aspect is that individual customers can generate significant revenues (e.g., $5,000 per month or more).

- Selling services is not, however, an easy task. The concept of computerized graphics is still relatively new to most firms. The idea of using a service instead of an in-house system is even newer. Thus, considerable education is required of the marketplace. This increases marketing costs and lengthens the sales cycle.

- In addition, since only certain types of drawings are best suited for services work (e.g., non-scale, repetitive), only those companies with sufficient volume of this work can be sold. Marketing costs to find these firms will not be insignificant.

- Finding operators willing to work second or third shift is very difficult, even for in-house operations. A service vendor's challenge is compounded because the input to the system comes from a variety of firms. This implies more frequent communication with the creator of the input drawing. Inability to get quick answers regarding drawing ambiguities negatively impacts the fast turnaround which is a key service vendor benefit.

- Another factor making the marketplace a selective one is that users feel they must be physically close (at least within 100 miles, preferably within 50) to the vendor in order to avoid the security, damage potential, and delay of mail.

- On the positive side, however, INPUT believes that GD has a unique opportunity to enter an emerging marketplace and has competitive strengths which would be hard for other firms to duplicate.

    - Most service vendors to date are small, thus financially less stable. GD can offer size, commitment, and financial viability.

    - The Ft. Worth-Dallas marketplace appears to have no significant competition at this time. GD could fill this gap.

- A major revenue opportunity exists.

- Skills and resources required for the market are familiar to GD.

- The future of the technology of the market revolves to a great extent around software capabilities which expand the capabilities of the CG system, and integrate it into other functions and systems. Software development and integration techniques are key strengths of GD.

- Acquisition opportunities may exist which could allow GD to obtain market share at a more rapid pace than possible with a "ground zero" start-up situation. Many of the service firms which have carved a niche for themselves seem uncertain how to grow and when. Entrepreneurially oriented founders may lack skills or resources to grow commensurate with the market opportunity.

3. RECOMMENDATIONS

- INPUT recommends that GD give serious consideration to the opportunities found in the computerized graphics services marketplace. As discussed above, the market will experience excellent growth nationally. Ft. Worth-Dallas represents a major untapped market.

- Should GD elect to consider a specific strategy for entering this market, INPUT recommends the following considerations:

  - Commitment: GD must establish an operational unit that externally reflects GD's long term commitment to the business. This implies, among other things, a specific business identity and a place of business separate from GD's other activities.

  - Specialization: An important key to profitability in the service business is maximum utilization of the machines per dollar of revenue. Operators, and hence the machines, are the most productive when they best understand the type of drawing being processed. This requires specialization by drawing type.

- Training: Customer training will be an important and initially costly undertaking. The discipline required for coding drawings for entry into CG systems will be new to most customers. They must be taught (and re-taught) until their input is clean and legible, thereby allowing efficient processing to take place.

- Drafting, not Design: The marketplace currently is for drafting work, not design. Thus, the hardware, software, and operators selected for this service must reflect this orientation.

- Timing: Ripe markets do not last very long. Other firms will see the opportunity and soon jump in. GD should move quickly if it wishes to make an impact on the market.

IV TANDEM SYSTEMS SOFTWARE

IV TANDEM SYSTEMS SOFTWARE

A. INTRODUCTION

1. PRODUCT DESCRIPTION

- Three GD systems software programs which enhance the functional capability of Tandem computer systems were surveyed for market potential. They are:

    - Tandem-IMS Interface: This program allows Tandem application programs to communicate with IBM IMS application programs. It requires no IMS modifications, supports COBOL, FORTRAN, and TAL programs, allows up to 16 applications to communicate with IMS at once, and queues messages for later forwarding if IMS or the application is not available.

    - Enhanced Remote Batch Facility: This program replaces Tandem's existing 2780/3780 emulator. This new product would use communication lines more efficiently, be faster, offer console support and support multiple users.

    - Audio-Response Interface: This software allows an audio-response unit to be interfaced to a Tandem computer.

- These packages enhance client's investment in Tandem computers by either helping to integrate Tandem with existing mainframe resources, and/or by expanding Tandem's capabilities into additional application areas.

- GD and INPUT agreed to focus a majority of the Tandem systems software portion of the survey on the Tandem-IMS Interface package.

2. INTERVIEW PROFILE

- Exhibit IV-1 profiles the seven companies interviewed for this portion of the survey.

- Respondents were chosen from known Tandems users who also had large IBM mainframes.

  - Three users are located in the West, two are from the East, and two are from the Midwest.

  - The number of Tandem systems per respondent ranged from one to six with the average being three. Five of the seven respondents were planning to acquire additional Tandems in 1980. The average number of additional Tandem systems to be acquired was two.

  - Four respondents were banks. The three additional respondents came from transportation, textile manufacturing and retailing.

- Eighty-six percent of the respondents interviewed had technical management responsibilities. Their titles included Systems Programming Manager, Manager, System Software, Technical Director, and Vice President.

EXHIBIT IV-1

RESPONDENT PROFILE - TANDEM SYSTEMS SOFTWARE

CHARACTERISTICS	RESPONDENTS						
	1	2	3	4	5	6	7
SALES ($ BILLION)	$3.0	$0.7	$24.0 ASSETS	$95.0 ASSETS	$1.0	$16.5 ASSETS	$16.0 ASSETS
INDUSTRY	RETAIL	TEXTILE MFR.	BANK	BANK	TRANSPORTATION	BANK	BANK
LOCATION	MISSOURI	SOUTH CAROLINA	ILLINOIS	CALIF.	QUEBEC, CANADA	CALIF.	CALIF.
IBM COMPATIBLE CPU (QUANTITY-MODEL)	1-158 1-145 2-4331	2-158	2-168 3-158	4-3033 7-168	2-AMD V7	3-168 1-158	4-3033
# TANDEMS -NOW	1	1	6	2	2	3	6
-ADD IN 1980	+2	+1	YES	+3	+1	0	0
IMS	NO①	YES	YES	YES	YES	NO	YES
IRSS	NO	NO	NO	YES	NO	NO	NO

① CURRENTLY EVALUATING IMS

B. TANDEM-IMS INTERFACE

1. PRODUCT INTEREST

- There is significant product interest in the Tandem-IMS Interface. Fifty-seven percent of the respondents indicated a high interest , while the balance (43%) specified a medium interest.

- All of the respondents specifying a high interest were banks.

- When asked about the timeliness of their interest, 43% said "Immediately", 43% said "Within six months" and the balance (14%) stated "Within twelve months."

- IBM's Intelligent Remote Station Support (IRSS) software product is required to run GD's Tandem-IMS Interface. Eight-six percent of the respondents did not have that option currently installed.

2. COMPETITION

- No respondent currently has any capability similiar to the Tandem IMS Interface.

- None of the respondents were aware of any product on the market similar to it. (One company vaguely remembered a presentation at the most recent Tandem Users Meeting concerning such a product. They guessed "it may have been marketed by MCAUTO," but weren't entirely sure. It seems likely they were referring to the GD presentation at the Tandem Users Group Meeting.)

- Tandem Computers, Inc., markets a software package for communicating with IMS, but modifications are needed to the application programs - an expensive undertaking. Cost of the product is about $4,000.

3. EVALUATION AND BUYING METHODS

- When asked to specify by what criteria they would evaluate a Tandem-IMS Interface, respondents replied:
    - Proper security facilities (4 mentions).
    - Acceptable performance such as response time and computer resources consumed (4 mentions).
    - Quality of vendor support, especially maintenance (3 mentions).
    - Compatibility with existing systems (2 mentions).
    - Vendor stability and longevity.
    - Access to source code if vendor is not the hardware manufacturer.
- Respondents were concerned that the product have certain specific features of interest to their site. Features desired included:
    - File, record and transaction transfer.
    - Queue messages for later forwarding (respondent stated he had some specific ideas on how he would like to see this work).
    - Product capabilities that are an extension of the function that would allow batches of data to be shipped from one Tandem to another (i.e., into IMS or out of IMS and into one Tandem or another).
    - Screening formatting.
    - Method of injecting transactions into IMS.

  - Mode-to-mode message switching.
  - Keep transmitted data (from applications programs) in message holding system.
  - Classification of messages.
  - Have routing symbolic instead of specifying a specific Tandem node.
  - Printing of data that would be sent into such a system.
  - Non-IMS DBMS interface.

- Respondents had trouble placing a price on the Tandem-IMS Interface capability. After some prompting, three of the seven respondents replied as follows:

Respondent A:			$ 20,000
Respondent B:	$50,000	to	$100,000
Respondent C:	$30,000	to	$ 60,000

- When asked how they arrived at the above figures, most were quite vague, but included as one factor "the cost to do it ourselves." Respondent A ($20,000) replied that such a price would be consistent with what Tandem and other mainframe software companies charge for systems software.

- When specifically asked what it might cost to develop a Tandem-IMS capability in-house, four respondents offered answers ranging from $10,000 to $60,000. One respondent estimated four man-years of effort.

- Personnel likely to be assigned to evaluate the Tandem-IMS package would be systems software and/or systems development project managers.

- The decision to buy, in every case surveyed, would be made at a senior level of DP management (e.g., General Manager, Vice President, etc.).

4. MARKET ANALYSIS

- Market Size: The cumulative revenue potential for GD's Tandem-IMS Interface ranges from $36,000 in 1980 to $696,000 for 1984. As shown in Exhibit IV-2, these estimates are based on a number of assumptions, including the following:

    - Tandem Computers, Inc., successfully expands its market penetration during the next four years among IBM users with IMS.

    - The software product itself is enhanced to the extent necessary to appeal to non-GD users.

    - The average revenue per unit sold is $12,000.

    - Fifteen percent of the eligible sites are sold.

- Market Opportunity Analysis: Exhibit IV-3 summarizes factors discussed in this survey concerning the attractiveness of marketing the Tandem-IMS Interface package. Listed under the "Pro" column are factors which are encouraging from a marketing point of view. Items listed under the "Con" column tend to add risk, uncertainty and/or a high level of expense.

    - All things considered, INPUT believes that the marketing of the Tandem-IMS Interface should be approached with caution. While the cumulative potential of $696,000 in sales is not insignificant, that revenue level is based on a number of critical assumptions, discussed above.

    - In addition, there are other factors related to the nature of the software products business, which GD should consider before making a final decision. These are outlined below.

EXHIBIT IV-2

MARKET SIZE - TANDEM TO IMS INTERFACE

YEAR	(A) NUMBER OF TANDEM CUSTOMERS TO DATE	(B) NUMBER WITH IMS②	(C) POTENTIAL UNIT SALES TO DATE③	(D) POTENTIAL REVENUE TO DATE ($000)④	(E) POTENTIAL REVENUE PER YEAR ($000)
1979	200①	64	-	-	-
1980	300	96	3	$ 36	$ 36
1981	500①	160	16	$192	$156
1982	700	224	34	$408	$216
1983	1,000	320	48	$576	$168
1984	1,200	384	58	$696	$120

① GD ESTIMATE BASED ON UNOFFICIAL ESTIMATE FROM TANDEM EMPLOYEES

② CALCULATION = COLUMN (A) X 40% X 80% WHERE:

- a) 40% = NUMBER OF TANDEM CUSTOMERS WHICH HAVE LARGE IBM MAINFRAMES (UNOFFICIAL TANDEM EMPLOYEE ESTIMATE).
- b) 80% = NUMBER OF LARGE IBM MAINFRAME SITES WHICH ALSO USE IMS (INPUT ESTIMATE).

③ 15% OF MARKET (COLUMN (B)), EXCEPT 1980 AND 1981 WHICH ARE START-UP YEARS.

④ AT $12,000 PER UNIT SOLD.

EXHIBIT IV-3

MARKET OPPORTUNITY ANALYSIS - TANDEM TO IMS INTERFACE

PRO	CON
A. MARKET EXISTENCE 1. 100% OF RESPONDENTS HAD INTEREST 2. 43% WOULD EVALUATE "IMMEDIATELY"	A. MARKET EXISTENCE 1. OVERALL MARKET IS SMALL
B. MARKET GROWTH 1. TANDEM COMPUTER SALES GROWING RAPIDLY	B. MARKET GROWTH 1. TANDEM COMPUTER MARKET TO BECOME INCREASINGLY COMPETITIVE
C. OPPORTUNITY FACTORS 1. $0.7 MILLION REVENUE OPPORTUNITY, BUT OVER 5 YEAR PERIOD 2. MAY BE WILLING TO PAY $12K+ PER UNIT 3. LITTLE SOFTWARE COMPETITION CURRENTLY	C. OPPORTUNITY FACTORS 1. SMALL MARKET 2. DEPENDENT UPON IBM'S IRSS 3. SIGNIFICANT ENHANCEMENTS MAY BE REQUIRED 4. HIGH QUALITY MAINTENANCE SUPPORT REQUIRED

- Characteristics of the Software Products Business:

  - Significant financial opportunities exist for vendors who become successful in the software products business. Profits before taxes, while averaging from 10% to 15%, can be double or triple that level in many cases. Achieving the higher levels of profitability results from combining a superior product with excellent marketing and technical management.

  - Potential software products vendors, however, must be prepared for one to two years of negative cash flow during the start-up phase of their business. It is not unusual that a cash investment of $150,000 to $250,000 is required to take one product from the "ready to be test marketed" phase to "cash flow break-even."

  - The business is also characterized by high fixed costs (mostly personnel), a high labor content of skilled, scarce and expensive people (these costs usually exceed 50% of sales), and a good sized investment in marketing (typically 25% to 50% of revenues).

  - Keys to success in software products include:

    - Very close match between product features and market needs.

    - High product reliability.

    - Thorough test marketing.

    - Insightful marketing.

    - Effective technical management.

    - High level of customer support.

  - Continuous investment of 5% to 15% of sales in product enhancements. (Software products, on the average, must be rewritten every two or three years.)

  - Full-time commitment by employees.

- Marketing Alternatives: GD has a number of options to consider regarding the marketing of the Tandem-IMS Interface:

  - Market using GD employed sales personnel.

  - Market on a direct mail basis.

  - License a third party to market.

  - Do not market.

  - In INPUT's opinion, the revenue potential of the Tandem-IMS Interface is not sufficient to support an entire software products business requiring on-site marketing. However, it could be a starting point for initiating such a business if additional, complementary products can be identified which can be sold and installed by the same personnel assigned to the Tandem IMS product. These additional products provide a cushion in case the Tandem IMS products peaks earlier than anticipated. On the other hand, should it be successful, then a customer franchise exists which would be favorably inclined towards other products from the same vendor.

  - Thus, INPUT recommends that if additional products can be envisioned, then GD should continue to investigate the marketing attractiveness of the Tandem-IMS Interface. The next logical steps in the market analysis phase are outlined in the following section.

- Should additional follow-on products not be identified by GD, consideration should be given to licensing a third party to market the software. One company, Analysts International Corporation, is experienced in marketing Tandem applications software, and would be interested in considering products such as GD has (or will) develop. INPUT talked with Mike Blake, District Manager, Chicago (312-882-4673). AIC offers royalty arrangements, and is willing to take over support and maintenance also.

5. SUGGESTED NEXT STEPS FOR THE MARKET ANALYSIS PHASE

- Key Issues to Resolve: The three key issues regarding the marketability of the Tandem-IMS Interface are:

  - Magnitude of enhancements required to provide a market of the size required to make the venture financially viable.

  - Determination of the price the market will pay.

  - Identification of complementary, follow-on product candidates.

- The first two issues can be resolved by the initiation of a carefully conceived and controlled test marketing program. The objective of this program is to confirm that the product does, in fact, have a close fit with the market at a price high enough to allow acceptable financial returns.

  - The method of test marketing typically involves an active campaign to sell and install from one to three systems within a short time frame. Should this phase be successful, then sufficient information exists for a decision to be made on the full commitment to the product as a foundation for a business.

- Two additional Tandem related products researched during this survey were the Enhanced Remote Batch Facility and the Audio-Response Interface. Their attractiveness as potential follow-on products to the Tandem-IMS Interface is discussed below.

C. ENHANCED REMOTE BATCH FACILITY (ERBF)

1. INTERVIEW PROFILE

- The interview profile is identical to the Tandem-IMS Interface. Included within the questionnaire for that product were four questions dealing with the Enhanced Remote Batch Facility.

2. PRODUCT INTEREST

- The degree and timing of the interest in this product is shown in Exhibit IV-4. Respondents showed good interest in this product.
  - Thirty-nine percent had a high interest, and 25% had a medium interest, for a total of 64% of the respondents.
  - One-third indicated their interest was "Immediate", while one-third said "Within six months", and one-third specified "Within twelve months".
- One respondent citing medium interest indicated that such a product must support multi-leaving and SNA.
- Most respondents did not have any idea what they would expect to pay for such a product. However, one respondent did cite $30,000, while another stated "the same as we pay for Tandem's 'Exchange' software." "Exchange" sells for approximately $2,000.

EXHIBIT IV-4

MARKET INTEREST IN ENHANCED REMOTE BATCH FACILITY (ERBF)

MARKET INTEREST	MENTIONS	
	PERCENT	NUMBER
INTEREST HIGH	39%	3
MEDIUM	25	2
LOW	12	1
NONE	12	1
DON'T KNOW	12	1
TOTAL	100%	8
TIMING OF INTEREST IMMEDIATELY	33%	2
WITHIN 6 MONTHS	33	2
WITHIN 12 MONTHS	34	2
TOTAL	100%	6

3. MARKET ANALYSIS

- Exhibit IV-5 indicates a potential of $192,000 in sales over a five year period, assuming:

  - Continued active penetration of the IBM marketplace by Tandem.

  - A product of sufficient strength to sell 10% of the eligible prospects.

  - An average sales price of $4,000 per unit.

- Since Tandem already offers a product in this category, the price of the GD product is not likely to be significantly higher. In addition, the possibility exists that Tandem may improve its product in response to customer demands.

- Since this product has not yet been developed by GD, it will take a while for it to begin to penetrate the market. In the meantime, competition could emerge.

- INPUT believes that ERBF does not have the market potential sufficient to serve as a follow-on product to the Tandem-IMS Interface.

D. AUDIO-RESPONSE INTERFACE

1. INTERVIEW PROFILE

- Respondents interviewed for the Tandem-IMS Interface were also questioned regarding the Audio-Response Interface. Four questions addressing this topic were asked.

EXHIBIT IV-5

MARKET SIZE - ENHANCED REMOTE BATCH FACILITY (ERBF)

YEAR	(A) NUMBER OF TANDEM CUSTOMERS TO DATE	(B) NUMBER WITH LARGE IBM MAINFRAMES TO DATE②	(C) POTENTIAL UNIT SALES TO DATE③	(D) POTENTIAL REVENUE TO DATE ($000)④	(E) POTENTIAL REVENUE PER YEAR ($000)
1979	200①	80	-	-	-
1980	300	120	1	$ 4	$ 4
1981	500①	200	10	40	36
1982	700	280	28	112	72
1983	1,000	400	40	160	48
1984	1,200	480	48	192	32

① GD ESTIMATE BASED ON UNOFFICIAL ESTIMATE FROM TANDEM EMPLOYEES.

② COLUMN (B) = COLUMN (A) X 40%. 40% EQUALS NUMBER OF TANDEM CUSTOMERS WITH LARGE IBM MAINFRAMES (UNOFFICIAL TANDEM EMPLOYEE ESTIMATE).

③ 10% OF MARKET (COLUMN (B)), EXCEPT 1980 AND 1981 WHICH ARE START-UP YEARS.

④ ADD $4,000 PER UNIT SOLD.

2. PRODUCT INTEREST

- Respondents were either highly interested in the product (57%) or had no interest (43%). (See Exhibit IV-6.)

- Seventy-five precent of those expressing a high interest were banks.

- Of those that were highly interested, 50% indicated such interest was "Immediate", while 25% said "Within six months", and another 25% specified "Within twelve months."

- Only two of the seven respondents estimated what they would expect to pay for the Audio-Response Interface. One company stated "$10,000 to $20,000," while the other indicated "$20,000". Their reason for responding at this price level was that "it would not be hard to develop."

- Other comments received were:

  - "Must be easy to use."

  - "Interest depends on what unit it would accept."

  - "Concerned about the impact on application programs."

3. MARKET ANALYSIS

- INPUT considers the Audio-Response Interface of marginal attractiveness as a software product opportunity primarily because:

  - It is a very specialized marketplace within a market (Tandem users) that is itself quite small.

  - It is not likely to command a large selling price.

EXHIBIT IV-6

MARKET INTEREST IN AUDIO-RESPONSE UNIT

MARKET INTEREST	MENTIONS	
	PERCENT	NUMBER
INTEREST		
HIGH	57%	4
MEDIUM	0	0
LOW	0	0
NONE	43	3
DON'T KNOW	0	0
TOTAL	100%	7
TIMING OF INTEREST		
IMMEDIATELY	50%	2
WITHIN 6 MONTHS	25	1
WITHIN 12 MONTHS	25	1
TOTAL	100%	4

  - It may require support for a continually changing variety of devices.

E. RECOMMENDATIONS

- Neither ERBF nor the Audio-Response Interface qualify as acceptable follow on products to Tandem-IMS. Thus INPUT recommends that none of the Tandem systems software programs be marketed by GD. However, INPUT does suggest GD actively investigate the possibility of having a well established software products company market and support Tandem-IMS in exchange for royalty payments to GD.

F. OTHER OPPORTUNITY AREAS

- Two other opportunity areas for Tandem systems software were mentioned by respondents. They were:

  - Improved Tandem data base language: This respondent considered Tandem's existing data base language was deficient as a user oriented tool.

  - Intelligent SNA connection to IMS: The respondent defined "intelligent" as "not just another hardware box."

IN

V MANAGEMENT SCIENCE CONSULTING

V MANAGEMENT SCIENCE CONSULTING

A. INTRODUCTION

I. PRODUCT DESCRIPTION

- A Management Science (MS) consulting service would provide skilled GD specialists to outside firms on a project basis.

- These specialists are expert in the application of sophisticated analytical methods to complex business problems. Their skills encompass such areas as statistical analysis, financial analysis, modeling, simulation, and decision support systems.

- Potential advantages available to clients of this service include:

  - Use of special expertise on short-term projects, thereby avoiding the expense of full-time employees.

  - Ability to address critical problems immediately.

  - Objective advice from an external source.

2. INTERVIEW PROFILE

- As shown in Exhibit V-1, twelve companies were interviewed as prospective users. In addition, one vendor interview was conducted.

- Respondents were chosen primarily from manufacturing firms in the Ft. Worth - Dallas area.

- The users surveyed were selected with no prior knowledge of their attitudes toward, or usage of, external management science consultants.

- Exhibit V-2 summarizes respondent characteristics in terms of size, industry and location.

- A vast majority of the respondents interviewed had major responsibilities within the financial function of their organizations. These individuals were considered most likely to have responsibility for usage of management science techniques, or would know of such activities within other groups inside the company. Typical respondent titles were: Vice President and Treasurer; Controller; or Financial Planning Director.

B. MARKET CHARACTERISTICS

1. FACTORS AFFECTING MARKET GROWTH

- The overall need for increased usage of management science techniques is being stimulated by the growing complexity of doing business. Changes in technology, increased instability of the world economies, governmental demands, and the rise to influential levels of individuals with management science appreciation, all contribute to expanded usage of these analytical methods.

EXHIBIT V-1

RESPONDENT PROFILE - MANAGEMENT SCIENCE

CHARACTERISTICS	RESPONDENTS					
	1	2	3	4	5	6
SALES ($ MILLION)	$3.5B	$1.4B	UNDER $100	$502	$475	$250
NUMBER OF EMPLOYEES	60,000	20,000	900	2,700	7,000	2,400
INDUSTRY	DISCRETE MFR.	RETAIL & MFR.	PROCESS MFR.	UTILITY	PROCESS MFR.	DISCRETE MFR.
LOCATION	DALLAS	FORT WORTH	FORT WORTH	FORT WORTH	DALLAS	DALLAS
NUMBER OF ANALYTICAL EMPLOYEES ( )= PART TIME	8	9	1 (0.5)	0 (3)	0 (25)	8 (25)

(CONT.)

	7	8	9	10	11	12
SALES ($ MILLION)	$223	OVER $200	$200	OVER $200	$91	$87
NUMBER OF EMPLOYEES	5,900	OVER 1,000	N.A.	2,500	600	2,100
INDUSTRY	PROCESS MFR.	DISCRETE MFR.	DISCRETE MFR.	PROCESS MFR.	PROCESS MFR.	DISCRETE MFR.
LOCATION	DALLAS	FORT WORTH	DALLAS	FORT WORTH	DALLAS	DALLAS
NUMBER OF ANALYTICAL EMPLOYEES ( )= PART TIME	4 (2)	20 TOTAL	N.A.	24	3	25

B = BILLION
N.A. = NOT AVAILABLE

EXHIBIT V-2

RESPONDENT ANALYSIS - MANAGEMENT SCIENCE

CATEGORY	PERCENT OF RESPONDENTS
SALES	
OVER $500 MILLION:	25%
$100 TO 500 MILLION:	50
UNDER $100 MILLION:	25
TOTAL	100%
INDUSTRY	
DISCRETE MANUFACTURING:	42%
PROCESS MANUFACTURING:	42
UTILITY:	8
RETAIL:	8
TOTAL	100%
LOCATION	
FORT WORTH:	42%
DALLAS:	58
TOTAL	100%

- The increasing availability of proprietary data bases and models is another factor stimulating market growth.

- One of the key impediments to increased management science usage within any given firm, however, is the attitude of top management towards its usage. To many executives, such techniques are costly, confusing and potentially dangerous.

2. RESPONDENTS' USAGE OF MANAGEMENT METHODS

- Most respondents are employing management science techniques to some degree. When asked to indicate the extent of their usage of three types of analytical activities (i.e., "Complex Statistical or Financial Analysis;" "Modeling/Simulation;" "Complex Cost or Return-on-Investment Analysis"):

    - Ninety-two percent used at least one activity either "Somewhat" or "Often."

    - Thirty-three percent used all three activities "Often."

- Exhibit V-3 shows "Complex Statistical or Financial Analysis" was the most popular activity with 64% of the "Often" mentions. Other "Often" mentions were:

    - "Complex Cost or Return-on-Investment Analysis" (54%).

    - "Modeling or Simulation" (36%).

- Of the five replies received for "Complex Pricing Analysis," 60% citied "Often," and 40% indicated "None."

- Seventy-five percent of the firms which reported no activity in one or more of the analytical categories of Exhibit V-3, indicated, however, they were considering such methods for 1980.

EXHIBIT V-3

RESPONDENTS' ANALYTICAL ACTIVITY USAGE TO DATE

ANALYTICAL ACTIVITY	USAGE TO DATE			
	TOTAL RESPONSES	OFTEN	SOMETIMES	NONE
COMPLEX STATISTICAL OR FINANCIAL ANALYSIS	100% (11)	64% (7)	18% (2)	18% (2)
COMPLEX COST OR RETURN-ON-INVESTMENT ANALYSIS	100% (11)	54% (6)	28% (3)	18% (2)
MODELING OR SIMULATION	100% (11)	36% (4)	28% (3)	36% (4)
COMPLEX PRICING ANALYSIS	100% (5)	60% (3)	0% (0)	40% (2)

( ) = NUMBER OF RESPONDENTS

3. RESPONDENTS' INTEREST IN MANAGEMENT SCIENCE CONSULTANTS

- As shown in Exhibit V-4, 64% of the respondents had used management science consultants in the past.

- When asked if they were satisfied with the performance of the consultants, 78% of those who replied said "yes."

- However, when asked about the likelihood of using consultants in 1980, a majority (64%) said they would not.

- The four firms who had not used consultants in the past, also believed they would not be using any in the future. In contrast, only 43% of those using consultants in the past would not do so in 1980 (Exhibit V-4).

- Among the survey respondents, smaller companies were more likely to have used consultants in the past than larger firms. Exhibit V-5 shows that although 67% of the "Under $100 million" firms and 80% of the "$100 million to $500 million" companies used consultants in the past, this percentage dropped to 33% for those organizations "over $500 million."

- There was much less variation between firms of different size concerning their likelihood of using consultants in the future. The percentage of those answering "somewhat likely" or "very likely" ranged from 33% to 40% over the three size categories (Exhibit V-5).

- The $100 million to $500 million firms, however, were more likely to use consultants than companies in any other size groups.

EXHIBIT V-4

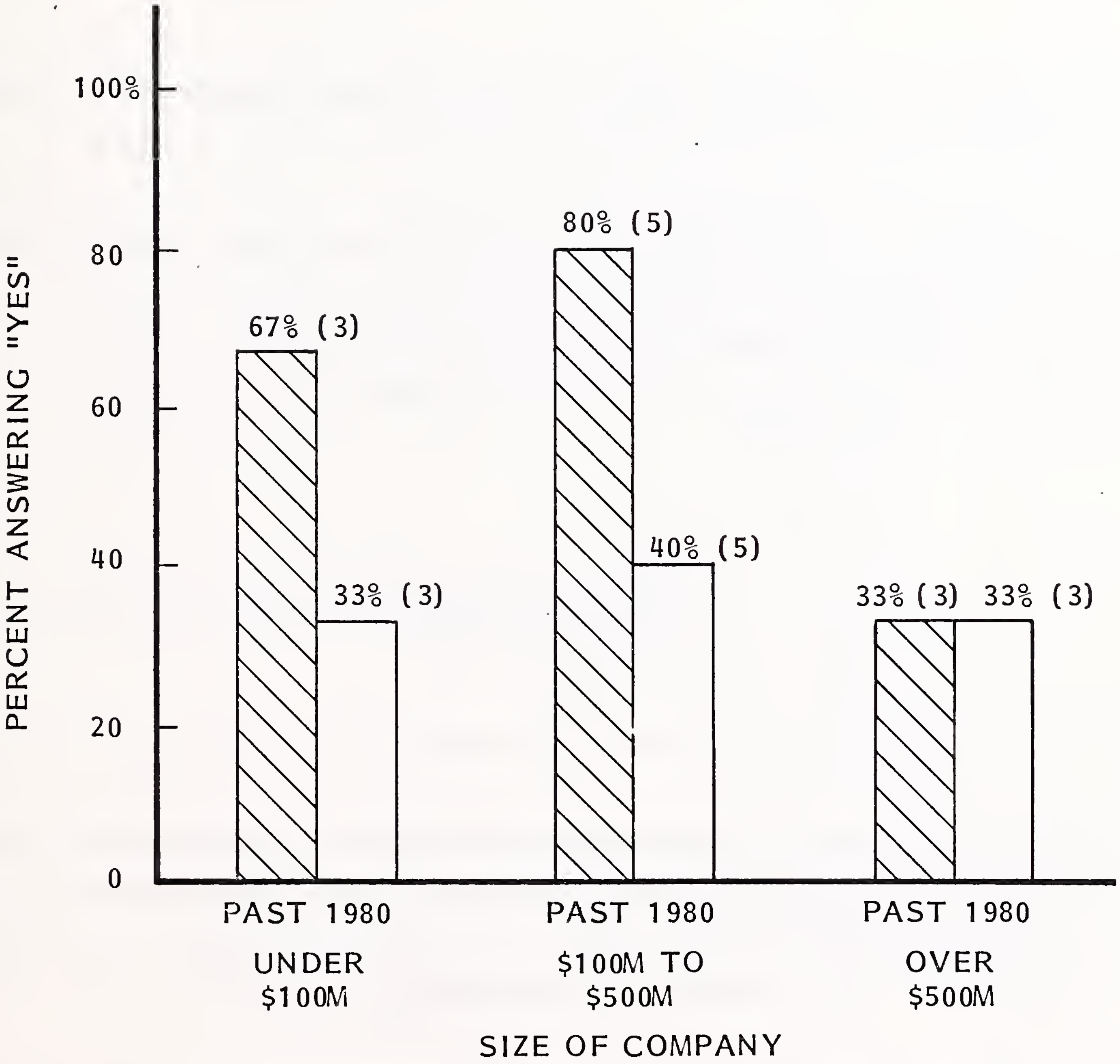
CONSULTANT USAGE - PAST AND FUTURE

CONSULTANT USAGE IN PAST?	TOTAL RE-SPONSES	LIKELY CONSULTANT USAGE IN 1980				
		VERY LIKELY	SOME-WHAT LIKELY	NOT LIKELY	DON'T KNOW	TOTAL RE-SPONSES
YES	64% (7)	14% (1)	29% (2)	43% (3)	14% (1)	100% (7)
NO	36% (4)	0% (0)	0% (0)	100% (4)	0% (0)	100% (4)
TOTAL	100% (11)	9% (1)	18% (2)	64% (7)	9% (1)	100% (11)

( ) = NUMBER OF RESPONDENTS

EXHIBIT V-5

CONSULTANT USAGE BY COMPANY SIZE



CODES:

( ) = NUMBER OF RESPONDENTS IN CATEGORY

M = MILLION

▨ = "PAST" = CONSULTANT USED IN PAST

☐ = "1980" = LIKELY TO USE CONSULTANT IN 1980

C. COMPETITION

- Competition for management science consulting is extensive and comes from a variety of sources:
    - Large nationally known, multi-discipline firms such as:
        - Big 8 accounting firms (e.g., Arthur Andersen, Arthur Young, etc.).
        - Consulting Companies (e.g., McKinsey; Booz, Allen & Hamilton; etc.)
    - Smaller regional and local firms which focus on a few speciality areas.
    - Universities and Colleges:
        - Professors.
        - Research Assistants.
        - MBA students doing field work.
    - Individuals (who are usually specialists).
- The Dallas edition of the Southwestern Bell Yellow Pages lists over 250 firms or individuals as "Management Consultants." While not all of them claim management science expertise, there is no shortage of people willing to advise management on how to handle business problems.
- In addition, significant indirect competition exists. (Indirect competition represents alternate ways for a customer to spend the money he might budget for a product, but which give the same value satisfactions. For example,

Cadillacs, fur coats, and luxury vacations may all compete for "prestige satisfaction" dollars.)

- The primary indirect competition for management science consulting is in-house personnel. The use of existing employees as "internal consultants" is a distinct trend that was reported in Harvard Business Review, November/December, 1979 ("Should You Have an Internal Consultant?"). For companies large enough to employ consultants on a frequent basis, this represents an option that increases accountability and reduces costs.

- Within smaller firms, the main competition is top management's fear of trying incomprehensible techniques on projects of major importance to the company.

- Among respondents to the survey, there is a high degree of awareness of vendor availability. Seventy-five percent of those questioned stated they were aware of vendors offering management science consulting in their metropolitan area. Two-thirds of those could cite one or more vendors by name (Exhibit V-6).

D. EVALUATION AND BUYING METHODS

I. EVALUATION CRITERIA

- When asked to specify criteria by which they would evaluate potential management science consultants, respondents replied:
  - Prior work in area of our need (3 mentions).
  - Consultants personally known by our own employees (3 mentions).
  - Credentials of the consultant himself, not his company (2 mentions).

EXHIBIT V-6

MANAGEMENT SCIENCE VENDORS MENTIONED

ARTHUR ANDERSEN
JOHN BARLEY
BIG 8 ACCOUNTING FIRMS
DATA RESOURCES, INC. (2 MENTIONS)
ARTHUR D. LITTLE
McCORMICK
McKINSEY
ON-LINE SYSTEMS
PRECEPT SYSTEMS
SOUTHWEST RESEARCH
SRI INTERNATIONAL
THE STRATEGIC INSTITUTE
ARTHUR YOUNG

- The respondents' primary interest is evaluating the specific individual who is proposed for the job. Clients want a very close fit between their needs and the consultant's personal experience and knowledge.

- Forty-two percent of the respondents cited the task of finding the right consultant as "difficult."

- Respondents also stressed the importance of "non-technical" skills of management scientists. Comments included:

  - "They (the management scientist) are too technically oriented. They need to temper the quantitative with the qualitative and be more oriented to management's actual needs when solving problems."

  - "We had some bad results with management scientists. The wrong question was addressed."

  - "Our forecast model was disaster. Management didn't understand what was being done and the consultants didn't work closely with them."

2. BUYING METHODS

- Evaluation of management science consultants, according to respondents, is done primarily by managers of the functional areas where the consultant would work. However, twenty-five percent of those questioned indicated an "executive committee and/or higher management" would be involved.

- The ultimate decision maker would be at the Vice President, President and/or Board level.

- Thus, the marketing of management science consulting must be to high level management. This factor, combined with the prospect's desire to evaluate the consultant personally, implies that consultants who can interact effectively with upper management will be able to compete most effectively.

3. PRICING

- Only three of the respondents (25% of the sample) could define how much they might expect their firm to pay for management science consultants. Of those, two indicated total project costs ranging from $5,000 to $30,000. One respondent indicated "$60-75 per hour."

- Thus, there appears to be little "prior expectation" concerning what is a reasonable price. Factors most influencing a customer's view of an "acceptable price" are likely to be:

  - Value of the project to the company if successful.

  - Competitive bids.

  - Perceived cost to do in-house.

  - Cost of not solving the problem.

E. MARKET ANALYSIS

I. MARKET SIZE AND GROWTH

- The market potential for management science consulting during 1979 is estimated to be $3.4 million for manufacturing companies in the $20 million and over sales level in Texas, Oklahoma, and Louisiana. This is expected to grow to $8.5 million by 1984, for an average annual growth rate (AAGR) of 20% (Exhibit V-7). This is based on the following assumptions:

EXHIBIT V-7

MARKET SIZE - MANAGEMENT SCIENCE CONSULTING
($ MILLION)

SALES	1979	1980	1981	1984
TOTAL REGIONAL MARKET POTENTIAL①	$3.4	$4.1	$4.9	$8.5
GD REVENUE POTENTIAL	-	$0.050	$0.250	$0.850

① MARKET POTENTIAL FROM MANUFACTURING FIRMS OVER $20 MILLION IN SALES IN TEXAS, OKLAHOMA AND LOUISANA

  - Ten percent of the type of companies described above use external management science consultants during the year. (Note that this is almost one-third of the 27% frequency of consultant usage encountered in our survey for 1979.)

  - The average project is two person-weeks per company per year.

  - The average rate paid is $500 per person-day.

  - Average annual growth rate for the market is 20%.

- Due to start-up considerations, the GD revenue potential for 1980 is estimated at $50,000.

- If GD captures 5% of the market by 1981, revenues will be $250,000 (Exhibit V-7).

- Capturing 10% of the market by 1984 yields $850,000 revenues.

2. KEY FACTORS

- Exhibit V-8 summarizes key factors which this survey has revealed regarding the market opportunity for management science consulting. Those factors which tend to be encouraging from a market opportunity point of view are listed under the "Pro" column. Those factors which tend to add risk, uncertainty and/or high level of expense are listed under the "Con" column.

3. RECOMMENDATIONS

- INPUT does not recommend that GD enter the management science consulting marketplace with a purely labor intensive service. Reasons include:

  - Competition is heavy.

EXHIBIT V-8

MARKET OPPORTUNITY ANALYSIS - MANAGEMENT SCIENCE (MS) CONSULTING

PRO	CON
A. MARKET EXISTENCE 1. 64% OF RESPONDENTS BOUGHT IN PAST 2. 78% OF THOSE WERE SATISFIED 3. TRADE PRESS ATTENTION 4. COMPETITIVE ACTIVITY 5. 92% OF RESPONDENTS DOING SOME MS IN-HOUSE	A. MARKET EXISTENCE 1. 64% OF RESPONDENTS NOT LIKELY TO BUY IN 1980
B. MARKET GROWTH 1. INCREASED COMPLEXITY OF PLANNING AND DECISION-MAKING 2. SOME RESPONDENTS FORECAST HIGHER FUTURE USAGE	B. MARKET GROWTH 1. INTERNAL CONSULTING STAFF GAINING POPULARITY
C. OPPORTUNITY FACTORS 1. GROWING DEMAND 2. GOOD CLIENT PAYOFF IF PROJECT SUCCESSFUL 3. GD HAS INTERNAL EXPERTISE	C. OPPORTUNITY FACTORS 1. HEAVY COMPETITION 2. HARD FOR MANAGEMENT DECISION-MAKERS TO UNDERSTAND WHAT THEY ARE BUYING 3. LACK OF NON-LABOR VALUE ADDED

- Profit margins will be squeezed if the service is strictly labor hours oriented.

- A great deal of investment in marketing is necessary due to the lack of understanding by high level decision makers concerning the pay-off from management science techniques.

- Long sales cycle are likely (average length = 5 to 8 months): This is due to: (1) the requirement to sell the need for such a service to top management, and (2) the client's concern that MS is a risky venture involving high front-end costs.

- Personal selling is costly and time consuming: The consultant who will do the project must be able to gain the personal confidence of both the client's project manager and the client's top management. Thus, it becomes an individual-to-individual sale requiring a great deal of non-billable time by the consultant.

- To overcome these problems, serious consideration should be given to incorporating some type of software support and/or proprietary data base with the consulting. This would help a tangible competitive edge and improve profit margins.

- Should GD elect to enter this marketplace with computer support, it is strongly recommended that a marketing strategy of Specialization be employed.

- The exact market segment that should be targeted is, of course, a function of what specialty areas GD selects.

- Based on survey results and considering the skills of GD's management science personnel, an attractive market segment candidate is manufacturing companies with sales in the $50 million to $500 million range.

- Companies of this size are less likely to have internal consulting staffs, yet are big enough that management science methods could bring significant payoffs.

- Should GD elect to enter this marketplace the following additional recommendations are offered:

  - The "Product": Consultants selected for this service should be:

    - Skilled at dealing with the people aspect of MS consulting as well as with the technical aspect.

    - Interested in developing and refining their specialty areas. Efforts should be made to engage them only in activities (and training) that further that specialty.

    - Effective in the marketing phase of the project. They should be at ease with client technicians as well as with client management at all levels.

  - Sales Promotion: The MS consulting service should promote the consultants themselves. They should become active in trade associations dealing with their specialty. Conference talks, committee memberships and trade press articles should be actively encouraged.

  - Territory: The service should be marketed throughout the U.S., not just locally. Due to the specialty nature of the service, it is not likely that a local approach would yield sufficient prospects to offset marketing and overhead costs.

  - Marketing Channels and Support: This service will require on-site marketing calls. While it is not necessary for the consultants themselves to be involved in the initial prospecting activities, they must be available for a variety of sales activities including capabilities presentations and discussions, as well as for client problem analysis and proposal development.

- Pricing: While it is highly advisable to avoid fixed price bidding until a number of similar projects have been undertaken, the heavy competitive nature of this service may force a fixed price approach more often than preferred.

4. SUCCESS REQUIREMENTS

- Commitment to the Business: The client, should he contract for an external consultant, is committing the success of an important project to personnel outside his direct control. Therefore, the client must be convinced that the vendor is seriously interested in establishing a first rate business reputation. Should the client perceive that the vendor has neither a serious nor long-term concern about his external business then he is likely to opt for a competitor who is. Thus, it is very important for GD to convey an image of (a) being in the MS consulting business, and (b) committed to the long-term success of that business.

- Selection of Consultants: The consultant and his support tools are the product. Only personnel who are skilled and highly motivated to sell and fulfill projects outside the GD environment should be selected.

- Marketing: To make a business out of management science consulting, marketing cannot be casual nor opportunistic. Resources must be committed to seek out, pursue and close qualified prospects actively. Marketing aids (presentations, capabilities brochures, case studies, contracts, mailers, etc.) must be skillfully developed which reflect the specific market strategy employed.

- Full-time Employment: Establishing a new business in a technical and highly competitive field is a challenging task. Those chosen for this effort must be provided with sufficient resources. In addition, they must dedicate their full-time efforts to it. Too many business opportunities have failed because the participants were diverted at crucial times to internal projects, or because, in the final analysis, there was no way to hold them accountable for outside business due to internal demands on their time.

VI NETWORK OPERATOR SOFTWARE

VI NETWORK OPERATOR SOFTWARE

A. INTRODUCTION

1. PRODUCT DESCRIPTION

- The network operator Programmed Assistance System (NETOP) is a GD developed systems software package that allows a computer operator to control a complete VTAM network from a single terminal.

- Important features of this package include:

  - IMS and/or CICS can be controlled through the NETOP terminal.

  - Control can be exercised over single or multiple VTAM computers.

  - Automatic error recovery procedures can be performed as defined by each installation.

  - Commands can be issued to the network on a predetermined, timed basis.

- Advantages of using NETOP include:

  - Reduces the personnel needed to manage a VTAM network.

- Reduces the time needed to recover from certain network problems.

- Can be easily installed.

2. INTERVIEW PROFILE

- As shown in Exhibit VI-1, four VTAM users were interviewed.

- Although the surveyed population is small, both single and multi-computer VTAM users were included. Number of terminals supported ranged from 200 to 1,500. Respondents had from one to four 3705s in the network. Seventy-five percent had IMS installed. None had CICS operational.

- All respondents had management responsibility for systems software activities in their companies.

B. MARKET CHARACTERISTICS

1. SIZE AND GROWTH

- There are an estimated 150 ACF/VTAM users currently in the U.S. This population is growing approximately 25-50% per year. (NETOP requires ACF/VTAM.)

- The more complex the network (in terms of multiple mainframes, number of 3705s, and number of terminals supported), the more benefit will be received from a network programmed operator (NPO) package.

- Those sites most likely to be interested in an NPO have:

  - Two hundred or more terminals and/or

EXHIBIT VI-1

RESPONDENT PROFILE - NETWORK OPERATOR SOFTWARE

CHARACTERISTICS	RESPONDENT			
	1	2	3	4
SALES ($ BILLION)	$5.2 SALES	$16.5 ASSETS	$16.0 ASSETS	$6.3 SALES
INDUSTRY	DISCRETE MFR.	BANK	BANK	PROCESS MFR.
LOCATION	TEXAS	CALIFORNIA	CALIFORNIA	TEXAS
CPU (NUMBER AND MODEL)	1-168	2-168	4-3033	2-3033
VTAM USER	YES	YES	YES	YES
NUMBER OF TERMINALS	500	200	1,500	200
NUMBER OF IBM 3705s	1	2	3	4
IMS	YES	NO	YES	YES
CICS	NO	NO	NO	NO

- Two or more geographically remote mainframes which are running teleprocessing.

Approximately 50% of all VTAM users are estimated to have these characteristics.

2. PRODUCT INTEREST

- There is significant market interest in network programmed operators. As shown in Exhibit VI-2, seventy-five percent of those surveyed either had some type of NPO installed, or were seriously evaluating one.

- One-half of the respondents indicated a high interest in a package with NETOP features. If such a package were available, they would evaluate it "immediately."

- The only company not evaluating an NPO currently was Respondent #1, the smallest site interviewed (one IBM Model 168 installed). However, even that site indicated medium interest in an NPO in the next 12 months.

3. FACTORS AFFECTING MARKET GROWTH

- Increased implementation of additional on-line systems will help fuel market growth for network programmed operators.

- Companies in every industrial section are placing increasing reliance on large, complex on-line systems to perform functions essential to their firm's daily operations.

- As this dependency upon on-line systems grows, the cost of system "down time" becomes greater. This provides a powerful economic incentive to utilize tools like an NPO which help reduce the time required to recover from network problems.

EXHIBIT VI-2

RESPONDENT INTEREST IN NETWORK PROGRAMMED OPERATORS (NPO)

FACTOR	RESPONDENT			
	1	2	3	4
USAGE OF ANY TYPE OF NETWORK PROGRAMMED OPERATOR (NPO)	NONE REJECTED NOSP 2 QTR 1978	NONE EVALUATING NCCF	IN-HOUSE SYSTEM GOT NOSP NEVER USED	NOSP INSTALLING NCCF
INTEREST IN NETOP (WHEN)	MEDIUM (WITHIN 12 MONTHS)	HIGH (NOW)	HIGH (NOW)	LOW

  - This point was reinforced by survey respondents. When asked to cite what factors influenced their company's interest in a NETOP-like product, the most commonly cited response was "to reduce error recovery time."

- Another factor stimulating market growth is the difficulty in finding good operator personnel. Since a network programmed operator can reduce operator manpower requirements, such a tool becomes increasingly attractive.

C. COMPETITION

I. PRODUCTS

- IBM was the only vendor identified during the survey as actively marketing network programmed operators in the U.S.

- IBM has two products available, NOSP and NCCF.

- NOSP (Network Operations Support Program):

  - Has been marketed for over two years.

  - Is priced at $125 per month.

  - Has met market resistance due to various shortcomings, including cumbersome installation methods.

- NCCF (Network Communication Control Facility):

  - Was introduced December 1979.

  - Replaces NOSP.

  - Is priced at $100 per month ($25 per month less than NOSP).

  - Has met with initial market enthusiasm. (Fifty percent of those interviewed were either evaluating or installing it.)

2. COMPARISON TO NETOP

- Exhibit VI-3 summarizes key differences between NETOP and NCCF as viewed by GD technical personnel at CDSC.

- A significant advantage of NCCF over NETOP is that it interfaces to NPDA, an IBM software package that maintains a data base on network performance.

  - NPDA is viewed by both respondents and surveyed internal GD personnel as an important and useful tool for network management.

  - NPDA's license price is approximately $50 per month.

- Another key advantage of NCCF is that it can interface with IBM's new intelligent modems. An article in Datamation, January 1980, entitled, "It's Still An Analog Word," called this capability a "revolutionary first."

- In addition, NCCF supports a wider variety of environments than NETOP, namely TCAM, DOS, and SVS.

- Two other less tangible, but nevertheless important NCCF features from a marketing point of view are that it:

  - Can be linked via telecommunications to IBM's problem file for rapid product problem analysis and resolution.

  - Has the potential to be updated faster to reflect VTAM changes, since IBM is the vendor of both software systems.

EXHIBIT VI-3

FEATURE COMPARISON: NETOP VERSUS NCCF

FEATURES UNIQUE TO NETOP	FEATURES UNIQUE TO NCCF
SUPPORTS IMS	INTERFACES TO NPDA (NETWORK PROBLEM DETERMINATION APPLICATION)
SUPPORTS CICS	INTERFACES TO IBM's NEW INTELLIGENT MODEMS
TIMER CONTROL FOR COMMAND LISTS	SUPPORTS TCAM
USES VTAM-DEFINED NETWORK PARAMETERS	SUPPORTS DOS AND SVS

- NETOP's advantages over NCCF include support of IMS and CICS. This feature allows IMS and CICS to be controlled at the NETOP terminal, thereby, potentially saving the cost of a separate IMS/CICS terminal.

- NETOP's timer control allows predetermined commands to be issued at specified times, or upon the occurrence of certain events. This increases network performance by eliminating the need to flood the system with large volumes of commands at the same time.

- NETOP appears to be simpler to install than NCCF since NETOP uses VTAM defined network parameters. This eliminates the need to prepare lengthy source statements during the installation phase, a potential savings of two or more person-days.

D. EVALUATION AND BUYING CHARACTERISTICS

1. EVALUATION CRITERIA

- Criteria cited by respondents for evaluating a NETOP-like product include:

    - Ease of use: This encompasses ease of installation, operation, and maintenance. Respondents emphasized the desirability of having English-like operator-system communication.

    - "Right" features: VTAM users want a product that fits their specific needs. Concern exists that a generalized package might include features not usable by a specific site which thus would cause network degradation with no site benefit.

    - Competitive price: IBM's low NOSP and NCCF pricing ($125 and $100 per month, respectively) has established a value standard that any competitor must meet or exceed.

- Stable package: This is particularly important since package errors could degrade network performance.

- Timely maintenance: It is important that the vendor respond quickly to accommodate VTAM changes and new releases.

- Security: One-half of the respondents mentioned security features as an important concern.

2. ADDITIONAL RESPONDENT COMMENTS

- During the course of the survey, respondents indicated a number of features which they would like to see in network programmed operators. These features were of a "like to see" rather than "must have" nature. They include:

  - Hooks to add custom features unique to a site (or custom modules to select).

  - Ability for operator to reference networks symbolically.

  - Ability to prompt operator on a tutorial basis.

  - Inclusion of a reporting capability.

  - Use as an operational documentation tool.

- One respondent, a Vice President, considered the degree of automatic error recovery as an important issue. As a high level technical manager (Vice President) he favored automatic error recovery. However, he believed that technicians (operators and their supervisors) would tend to resist automatic error recovery. He believed they would miss a great deal of important information about what was happening.

- Another respondent stated that developing an effective "universal" network programmed operator would be especially difficult due to the differences in VTAM environments from company to company.

3. PRICING

- Only two respondents had opinions concerning what they would expect to pay for a NETOP-like product.

- One individual specified "around $50,000." When asked to indicate why that figure came to mind, he indicated that it was close to estimates he had received from persons wanting to develop such a package.

- Another respondent believed such a package might be priced around $15,000, assuming it included additional capabilities, such as English-like commands for the operator, and the flexibility to define network components in English terms understandable to a user.

- This respondent also indicated that his answer of $15,000 was based on an assumption that such a package would result in the reduction of one-half person in operations. Assuming that one person's salary plus benefits was $20,000, that would amount to $10,000. He added another $5,000 to that for "additional value expected from the package."

4. BUYING METHODS

- Marketing costs increase as the number of people involved in the evaluation and decision making cycle increases. Costs also go up when the evaluators are different individuals from the decision makers.

- Respondents indicated that the evaluation of a NETOP-like package would be done by several technical managers. The number of different managers mentioned per respondent ranged from one to four, with the average being two to three.

- Titles of managers likely to do the evaluation included:
  - Manager, On-Line Systems.
  - Manager, Operations.
  - Manager, Software Systems.
  - Manager, Telecommunications.
  - Manager, Applications.
- The final decision to acquire such a package would usually be made by one individual at a senior DP management level. Titles mentioned in the survey for making this decision included:
  - Vice President, Teleprocessing.
  - Director, Data Processing.
  - Manager, Technical Services.
  - Manager, Network Services.
- The decision to buy is being made at an especially high level in the organization for such a low cost package. This may be due to the costly impact on the network if the package proves unreliable.
- Thus, from a marketing point of view, the buying methods of the NETOP package are moderately complex. This will increase marketing costs and the length of the sales cycle.

E. MARKET ANALYSIS

1. KEY FACTORS

- The market for network programmed operator software exists and is growing. The concept of such a tool appears well understood. In many cases firms are either developing their own, or are licensing NOSP or NCCF from IBM. Trade press articles support the value of such tools.

- The market will experience a good growth rate, due to on-line systems growth and the expense of network down time. One factor, however, tending to slow down such growth is the likelihood that distributed data processing systems will replace potential VTAM applications.

- Because the marketplace is looking for additional capabilities for a network programmed operator, GD has the opportunity to establish product differentiation by supplying these needs. In addition, GD has the technical and financial strength to compete should it choose to do so.

- However, there exists a number of negative factors:

    - The combination of a relatively small market and a low product price means the total revenue potential is not high. As shown in Exhibit VI-4, only 75 sites in 1979 were estimated to be large enough to justify an NPO. Assuming 15% of eligible sites could be sold at $100 per site per month, total GD cumulative revenue by 1984 is only $223,200.

    - IBM must be considered as a strong competitor. The recent introduction of NCCF, and its ability to interact with IBM's new intelligent modems, indicates IBM intends to actively compete in this marketplace.

    - Any vendor marketing a network programmed operator must be prepared for high support costs. In addition to the requirement for

EXHIBIT VI-4

MARKET SIZE - NETWORK OPERATOR SOFTWARE

CATEGORY	1979	1980	1981	1982	1983	1984
A. NUMBER VTAM SITES IN U.S.	300①	400	500	650	800	1,000
B. NUMBER ACF/VTAM SITES IN U.S.②	150	200	350	455	720	900
C. NUMBER ACF/VTAM SITES OF SUFFICIENT SIZE③	75	100	175	228	360	450
D. NUMBER SITES SOLD TO DATE④	0	4	26	34	54	68
E. ANNUAL REVENUE POTENTIAL ($000)⑤	$ 0	$4.8	$31.2	$40.8	$64.8	$81.6
F. CUMULATIVE REVENUE POTENTIAL ($000)	$ 0	$4.8	$36.0	$76.8	$141.6	$223.2

① AVERAGE ESTIMATE OF THREE RESPONDENTS

② 50% OF (A) FOR 1979-1980; 70% IN 1981; 90% AFTER 1981

③ 200 TERMINALS AND/OR AT LEAST TWO GEOGRAPHICALLY REMOTE MAINFRAMES: (B) X 50%

④ 15% OF AVAILABLE SITES: (C) X 15%, EXCEPT 1979, 1980

⑤ $1,200 REVENUE PER YEAR PER SITE SOLD

continuing enhancements due to VTAM changes, user demands and competitor moves, maintenance response must be quick and reliable. NETOP occupies a very sensitive position in the user's on-line environment. He will not tolerate frequent and/or slowly resolved problems.

- Exhibit VI-5 summarizes the market opportunity factors for NETOP which have resulted from this survey. Those factors which tend to be encouraging from a market opportunity point of view are listed under the "Pro" column. Those factors which tend to add risk, uncertainly and/or a high level of expense are listed under the "Con" column.

2. RECOMMENDATIONS

- INPUT recommends that GD not enter into the network programmed operator marketplace with NETOP. As discussed above, the revenue opportunity is low and the competition from IBM is strong.

- The only case where GD might consider entering such a market would be if it could define and develop a product which was so strongly differentiated from NCCF that it could command a price three to four times the current $100 per month. There might be an opportunity for such a product due to the high cost to the user of network mismanagement or failure. The NETOP features identified to INPUT for this survey, however, did not have sufficient value to make this higher price possible.

EXHIBIT VI-5

MARKET OPPORTUNITY FACTORS - NETWORK OPERATOR SOFTWARE

PRO	CON
A. MARKET EXISTENCE 1. GOOD INTEREST BY VTAM SITES 2. NOSP, NCCF ACCEPTANCE 3. TRADE PRESS ATTENTION	A. MARKET EXISTENCE 1. SMALL BASE OF SITES
B. MARKET GROWTH 1. ON-LINE SYSTEMS GROWTH 2. HIGH COST OF NETWORK DOWN-TIME	B. MARKET GROWTH 1. DDP WILL REPLACE SOME VTAM APPLICATIONS
C. OPPORTUNITY FACTORS 1. NEED FOR ADDITIONAL CAPABILITIES 2. GD TECHNICAL AND FINANCIAL STRENGTH	C. OPPORTUNITY FACTORS 1. SMALL MARKET 2. SMALL REVENUE OPPORTUNITY 3. STRONG IBM COMPETITION 4. HIGH SUPPORT COSTS

VII UNMET MANUFACTURING SYSTEMS NEEDS

VII UNMET MANUFACTURING SYSTEMS NEEDS

A. INTRODUCTION

1. SURVEY OBJECTIVE

- The objective of this portion of the survey is to identify important manufacturing systems productivity needs that are currently unsatisfied. This information will assist GD in further identifying internal resources and skills which if marketed, would fulfill important customer requirements.

2. INTERVIEW PROFILE

- As shown in Exhibit VII-1, 13 firms were interviewed.
  - All were discrete manufacturers.
  - Sales ranged from $8 million to $3.7 billion.
  - Eighteen percent of the companies have sales over $500 million, while 46% are in the $100-500 million range and 36% are below $100 million.
  - Eighty-five percent are located in South Central States (Texas, Oklahoma, Louisana, Arkansas).

EXHIBIT VII-1

RESPONDENT PROFILE - UNMET NEEDS

CATEGORY	RESPONDENTS						
	1	2	3	4	5	6	7
SALES ($ MILLION)	$3.7B	$800	$500	$500	$300	$260	N.A.
MAIN PRODUCT	ADVANCED ENGR. PRODUCTS	AIRCRAFT PARTS	BRAKE SYSTEMS	SHIP BUILDER	THRUST VALVES	OIL FIELD EQUIPMENT	HOT TUBS, BATHS
LOCATION	TEXAS	TEXAS	INDIANA	LOUISIANA	TEXAS	TEXAS	ARKANSAS
AUTOMATION USAGE ①	SAME	MORE	SAME	MORE	LESS	SAME	SAME
NOW DEVELOPING MAJOR SYSTEMS	NO	NO	YES	NO	NO	YES	NO

(CONT.)

CATEGORY	RESPONDENTS					
	8	9	10	11	12	13
SALES ($MILLION)	N.A.	$75	$25	$20	$10	$8
MAIN PRODUCT	PVC PIPES	AVIATION PARTS	OIL WELL TOOLS	DIE TOOLS	OIL WELL TOOLS	CUSTOM PLASTIC PARTS
LOCATION	TEXAS	OKLAHOMA	TEXAS	TEXAS	LOUISIANA	TEXAS
AUTOMATION USAGE ①	N.A.	LESS	MORE	SAME	LESS	LESS
NOW DEVELOPING MAJOR SYSTEMS	YES	YES	NO	YES	YES	NO

① IN COMPARISON WITH OTHER FIRMS IN SAME INDUSTRY
B = BILLION
N.A. = NOT AVAILABLE

- Respondents were selected with no prior knowledge of their automation usage or attitudes.

- Eighty-five percent of those surveyed were high level manufacturing managers. Titles included: Vice President, Manufacturing; Manager, Manufacturing; Plant Manager; Director, Manufacturing; Director, Engineering.

- Fifteen percent were staff personnel (i.e., Assistant to the Vice President; Facilities Planning) to which INPUT was referred by the firm's manufacturing manager because they were knowledgeable regarding the survey topic.

B. AUTOMATION ACTIVITIES

1. COMPARISON TO OTHER FIRMS

- When asked to compare their firm's usage of automation systems and methods with other companies in their industry, 25% believed they were more advanced. Forty-two percent indicated they were the same, while 33% believed they were less automated (see Exhibit VII-1).

2. TYPE OF SYSTEMS

- Of the automated systems in use, or to be installed in 1980, two out of three are machine related systems (e.g., numerical control, conveyers, robotics), while the other one-third are data systems (e.g., inventory control, data collection). (See Exhibit VII-2.)

- The system most frequently installed, or to be installed, was numerical control (23% of all mentions).

EXHIBIT VII-2

AUTOMATED MANUFACTURING SYSTEMS USAGE

SYSTEM AND STATUS	NUMBER OF MENTIONS	TYPE OF SYSTEM	
		MACHINE	DATA
INSTALLED TO DATE			
NUMERICAL CONTROL	6	6	
CONVEYOR SYSTEMS	3	3	
PRODUCTION PARTS CONTROL	2		2 ⓐ
INVENTORY CONTROL	2		2 ⓐ
PURCHASING			1 ⓐ
AUTOMATED MACHINE TOOLING	1	1	
CADAM	1		1
TRANSFER EQUIPMENT	1	1	
DATA COLLECTION	1		1
MANAGEMENT SYSTEM	1		1
TRANSFER LINE	1	1	
SYNCHRONIZED AND NON-SYNCHRONIZED PALATIZED LINES	1	1	
AUTOMATIC PROGRESSIVE STAMPING MACHINES	1	1	
SUBTOTAL -NUMBER	22	14	8
-PERCENT	100%	64%	36%
PLAN TO INSTALL IN 1980			
ROBOTICS	2	2	
NUMERICAL CONTROL	1	1	
LABOR REPORTING	1		1 ⓑ
TIME STANDARDS	1		1 ⓑ
DATA COLLECTION	1		1
CONTINUOUS CURING	1	1	
TURNING EQUIPMENT	1	1	
LATHES	1	1	
SEMI-AUTOMATED PIPE SHOP	1	1	
SUBTOTAL -NUMBER	10	7	3
-PERCENT	100%	70%	30%
TOTAL -NUMBER	32	21	11
-PERCENT	100%	66%	34%

ⓐ MATERIAL CONTROL ORIENTED DATA SYSTEMS

ⓑ PEOPLE CONTROL ORIENTED DATA SYSTEMS

- Conveyer systems were the second most frequently cited systems (10% of all mentions).

- Robotics, production parts control and inventory control tied (at 6% each) for third most frequently cited.

- Data systems to be installed in 1980 are addressing people control areas much more frequently (67% of all data system mentions) than those installed in the past.

    - A majority (63%) of the data systems installed prior to 1980 previously have been material control, rather than people control oriented.

3. DEVELOPMENT PLANS

- One-half of the respondents (49%) said their company was currently developing major manufacturing productivity systems in-house.

- Of those that cited reasons for developing new systems in-house rather than buying outside, 75% said "in-house expertise."

- The vast majority of firms currently developing major manufacturing systems are smaller companies that do not consider themselves as automation leaders:

    - Eighty percent had sales under $300 million.

    - None (0%) rated their company as being more automated than others in their industry.

- Of those willing to identify the automation areas which are the focus of their development activities, 71% identified machine systems, (e.g., robotics, coveyer systems), while 29% specified data systems (inventory control, billing). See Exhibit VII-3.

EXHIBIT VII-3

MAJOR MANUFACTURING SYSTEMS UNDER DEVELOPMENT

SYSTEMS	NUMBER MENTIONS	PERCENT OF TOTAL
MACHINE SYSTEMS		
ROBOTICS	1	
NUMERICAL CONTROL	1	
CONVEYOR SYSTEMS	1	
TOOLING	1	
PROGRESSIVE STAMPING MACHINES	1	
SUB TOTAL	5	71%
DATA SYSTEMS		
INVENTORY CONTROL	1	
BILLING	1	
SUB TOTAL	2	29
TOTAL	7	100%

C. AREAS OFFERING GREATEST POTENTIAL

1. AREAS CITED

- Respondents were asked to identify and prioritize areas of manufacturing that offer the greatest potential for productivity improvement, but which their company has not been able to address to thus far. Exhibit VII-4 summarizes their answers.

- Most respondents (69%) cited only two areas for greatest improvement potential. Only four of the respondents (31%) specified more than two areas. None cited more than four. Respondents specifying more than one area were asked to prioritize them.

- Improvements in "Processes" were most frequently cited with 28% of all mentions.

- "People" related areas were the next most popular, with 24% of the total responses.

- The most frequently mentioned areas were:

  - Lack of worker commitment (3 mentions).

  - Inventory control (3 mentions).

  - Robotics to improve assembly line methods (2 mentions).

  - Less manpower (2 mentions).

  - Less paperwork (2 mentions).

  - Machine capability planning (2 mentions).

EXHIBIT VII-4

AREAS WITH GREATEST POTENTIAL FOR PRODUCTIVITY IMPROVEMENT

CATEGORY	AREA	NUMBER OF MENTIONS	
		NUMBER	PERCENT OF TOTAL
PROCESSES	ROBOTICS NUMERICAL CONTROL METAL REMOVAL COOLING SYSTEM LABOR ASSEMBLY① BONDING	2 1 1 1 1 1	
	SUBTOTAL "PROCESSES"	7	28%
PEOPLE FACTORS	LACK OF WORKER COMMITMENT LESS MANPOWER INCREASED CAPABILITY OF ENGINEERING	3 2 1	
	SUBTOTAL "PEOPLE"	6	24%
DATA SYSTEMS	LESS PAPERWORK STANDARD COST CHANGES COMPUTER RESPONSE TIME	2 1 1	
	SUBTOTAL "DATA SYSTEMS"	4	16%
MACHINE PRODUCTIVITY	MACHINE CAPACITY PLANNING MACHINING CAPABILITY	2 1	
	SUBTOTAL "MACHINE PRODUCTIVITY"	3	12%
INVENTORY MANAGEMENT	INVENTORY CONTROL	3	
	SUBTOTAL "INVENTORY MANAGEMENT"	3	12%
OTHER	MORE REPETITIVE MANUFACTURING OPERATIONS PLANNING	1 1	
	SUBTOTAL "OTHER"	2	8%
TOTAL	-NUMBER -PERCENT	25	100%

① COMPANY HAS LOW VOLUME PRODUCTION ITEMS

- Exhibit VII-5 shows the results when the responses are analyzed by the frequency of receiving a "first priority " vote.

  - Inventory management was most frequently (100% of all mentions) voted first priority.

  - The balance of the categories were closely ranked, with the frequencies ranging from 33% to 50%.

2. REASONS WHY NEEDS ARE UNMET

- There was a diversity of opinions concerning why the needs cited above had not been met. See Exhibit VII-6.

- Not surprisingly, none of the managers interviewed placed the blame on management policies or attitudes. Instead the responses focuses on areas generally considered to be outside the control of the manufacturing unit:

  - Bad worker attitude and lack of skills were frequently mentioned (19%).

  - Additional popular responses were: lack of standards, predictable work flow; cost; absence of tools and technology. Each received 19% of the mentions.

  - Rapid growth was given blame by two respondents (12% of the mentions).

3. FACTORS INCREASING WILLINGNESS TO AUTOMATE

- Of the factors mentioned which would increase their firms willingness to automate, 40% deal with external market factors related to the nature of customer demand (Factors A and E in Exhibit VII-7).

EXHIBIT VII-5

RANKING OF CATEGORIES BY FREQUENCY OF "FIRST PRIORITY" VOTE ①

CATEGORY	PERCENT RECEIVING "FIRST PRIORITY" VOTE	NUMBER OF VOTES/ NUMBER OF RESPONSES
INVENTORY MANAGEMENT	100%	3/3
PEOPLE FACTORS	50%	3/6
DATA SYSTEMS	50%	2/4
OTHER	50%	1/2
PROCESSES	43%	3/7
MACHINE PRODUCTIVITY	33%	1/3

① SEE EXHIBIT VII-4 FOR DETAIL

EXHIBIT VII-6

REASONS WHY NEEDS HAVE BEEN UNMET

REASONS	MENTIONS	
	NUMBER	PERCENT TOTAL
WORKERS' BAD ATTITUDE, LACK OF SKILLS	3	19%
LACK OF STANDARDS, PREDICTABLE WORK FLOW	3	19
LACK OF TOOLS, TECHNOLOGY	3	19
COST	3	19
RAPID GROWTH	2	12
OTHER ①	2	12
TOTAL	16	100%

① OPERATING ON ANTIQUATED STANDARDS; IN HOT CLIMATE

EXHIBIT VII-7

FACTORS INCREASING WILLINGNESS TO AUTOMATE

FACTOR CODE	FACTORS	MENTIONS	
		NUMBER	PERCENT OF TOTAL
A.	MORE STANDARDIZED PRODUCTION RUNS	5	33%
B.	WORKER COST/LACK OF SKILLS/ UNAVAILABILITY	3	20
C.	AVAILABILITY OF NEW EQUIPMENT ON THE MARKET	3	20
D.	REDUCTION IN COST OF AUTOMATION	2	13
E.	INCREASED MARKET DEMAND FOR COMPANY PRODUCTS	1	7
F.	COMPETITION	1	7
TOTAL		15	100%

- The most common single factor cited was "more standardized production runs" (33%).

- Twenty percent of those interviewed cited increased worker costs and/or their lack of skills or availability.

- One-third of the respondents said that either the availability of new automation equipment and/or a reduction in its cost will help improve the likelihood of additional automation (Factors C and D in Exhibit VII-7).

D. OTHER AREAS

- One manager representing a large discrete manufacturing firm in Texas voluntarily described what he considered a major unmet need. His concern was how to find a way to allow large non-IBM mainframes (like CDC) to access IMS data bases. He speculated that perhaps the solution might be in the form of a hyper-channel that would allow the non-IBM mainframe to look like a high speed peripheral. He emphasized that this was a multi-million dollar type of decision for his company. He was interested in who was looking at the possibility and/or who had done it. He believed any large manufacturing company with large IBM and scientific mainframes woud have the same problem.

E. IMPLICATIONS

- Respondent attitudes towards the use of automation are almost universally positive. This is very important from a marketing viewpoint since most of those interviewed for the survey would be directly involved in any decision to buy new automation methods.

- A majority of the respondents (81%), however, believed that the causes for unrealized productivity improvement potential, were not from a lack of suitable automation products, but rather were due to factors outside the control of the manufacturing managers (e.g., worker attitude, unpredictable work flow, growth, etc.).

- Respondents viewed their work force as a major problem area. Labor's lack of availability, skills and/or commitment was cited as both a reason why major areas for productivity improvement have gone unrealized, and as a factor that encourages further automation.

- The high rate of in-house development of new automation systems underscores the importance of such methods to the company, as well as highlights the potential for new vendor supplied product.

F. RECOMMENDATIONS

- Based on the "unmet needs" survey results, it is recommended that GD be especially alert to new product opportunities which address:

  - Inventory management.

  - Improvement of worker commitment, skills and availability.

  - Reduction of people costs.

  - Robotics.

- Caution should be exercised at all times, however, when analyzing market potential. A significant marketing obstacle is the decision-maker's belief that his manufacturing problems are due to causes outside his control. This will provide his reasons for hesitating about additional automation, and will thus increase vendor marketing costs by a significant amount. This situation, however, is not uncommon in emerging but high potential markets.

VIII PRODUCT COMPARISONS

VIII PRODUCT COMPARISONS

A. COMPARISON CRITERIA

- This portion of the report compares the relative marketability of the products surveyed.

- The criteria by which this comparison is undertaken includes the following elements:

  - Market size and growth.

  - Magnitude of both short-term (one to two years) and long-term (five years) revenue and profit potential.

  - Degree of competition.

  - Closeness of fit to GD's key strengths and strategic directions.

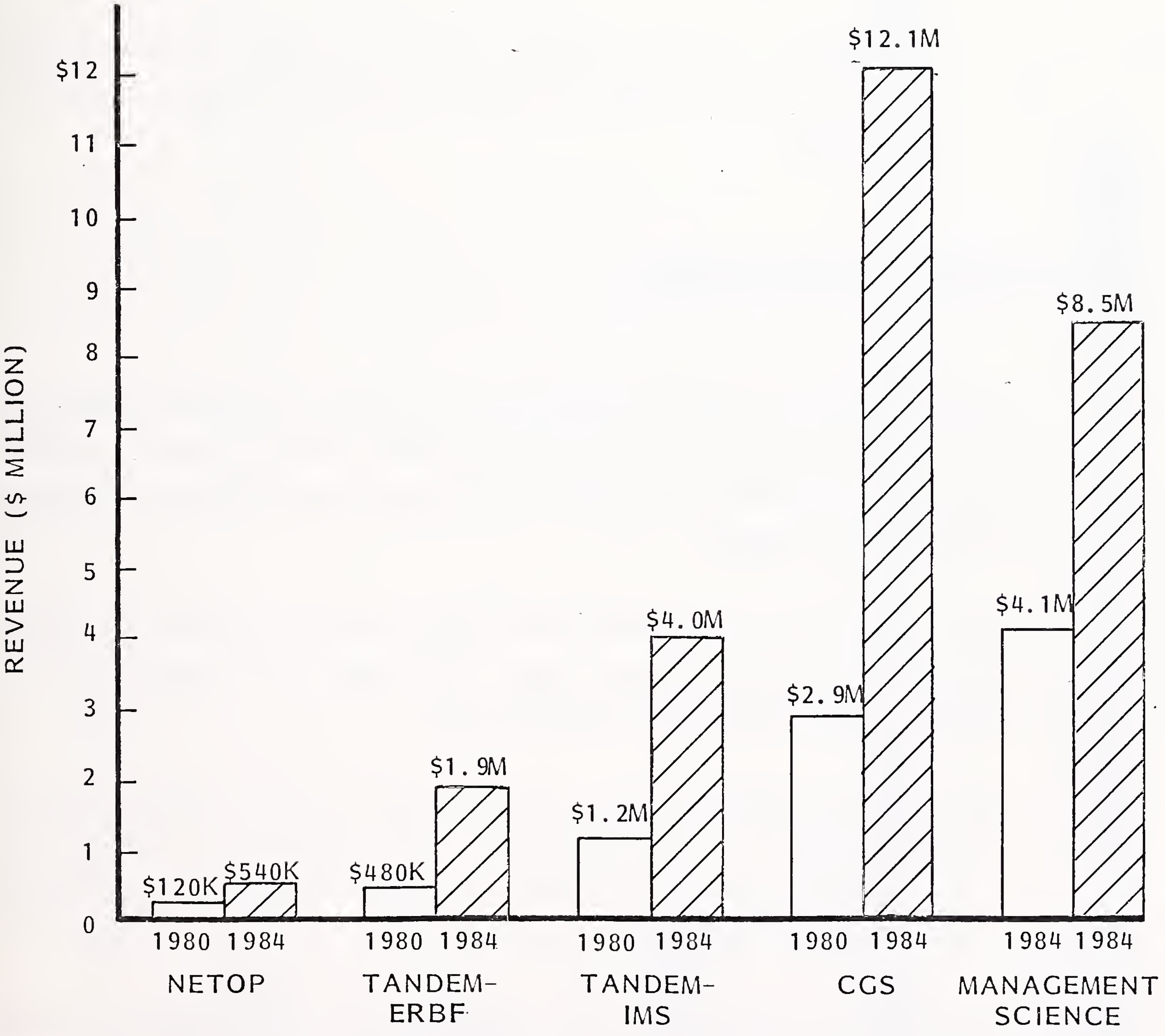
  - Nature of the marketing task.

B. MARKET SIZE, GROWTH, AND COMPETITION

- Market size, growth, and competition are extremely important when analyzing product opportunities.
    - A market that is not growing may be unattractive even if there is little competition. The cost in terms of money, time, and resources may simply be too great to ever realize an adequate return.
    - Conversely, a market that is growing significantly may offer excellent potential even if there is much competition. The increasing size of the market may outstrip the ability of current suppliers to adequately serve it.
    - A large market may be growing at a slower rate than a smaller market, but if the absolute increase in customer expenditures is significant and the competition is not equipped to easily capture it, then an interesting opportunity may exist.
- Exhibit VIII-1 illustrates graphically the relative differences between the surveyed products regarding market size and growth. The market potential is shown for each product.
- There is great variation in the annual market potential between the products.
    - The NETOP market is the smallest for both 1980 and 1984.
    - The Tandem-ERBF market is showing a good growth rate over the next several years, but the total potential market size by 1984 is not large ($1.9 million) in comparison with other products surveyed.

EXHIBIT VIII-1

COMPARATIVE ANNUAL MARKET POTENTIAL (1980, 1984)



CGS = COMPUTERIZED GRAPHICS SERVICES
K = $000
M = $000,000

- Tandem-IMS has a 1980 potential market over twice the size of Tandem-ERBF. By 1984 this market will triple to $4.0 million.

- Computerized graphics service has good market potential for 1980 at $2.9 million. In addition, it has an excellent growth rate that yields a $12.1 million market by 1984, by far the largest potential of the products analyzed.

- Management science consulting has the largest current market potential at $4.1 million, and the second largest potential in 1984 at $8.5 million.

C. GD REVENUE OPPORTUNITY

- Exhibit VIII-2 shows INPUT's estimates of GD's revenue opportunities for each product in comparison with one another and with the overall market potential. Also shown is a qualitative indication of the relative magnitude of competition in each of these markets.

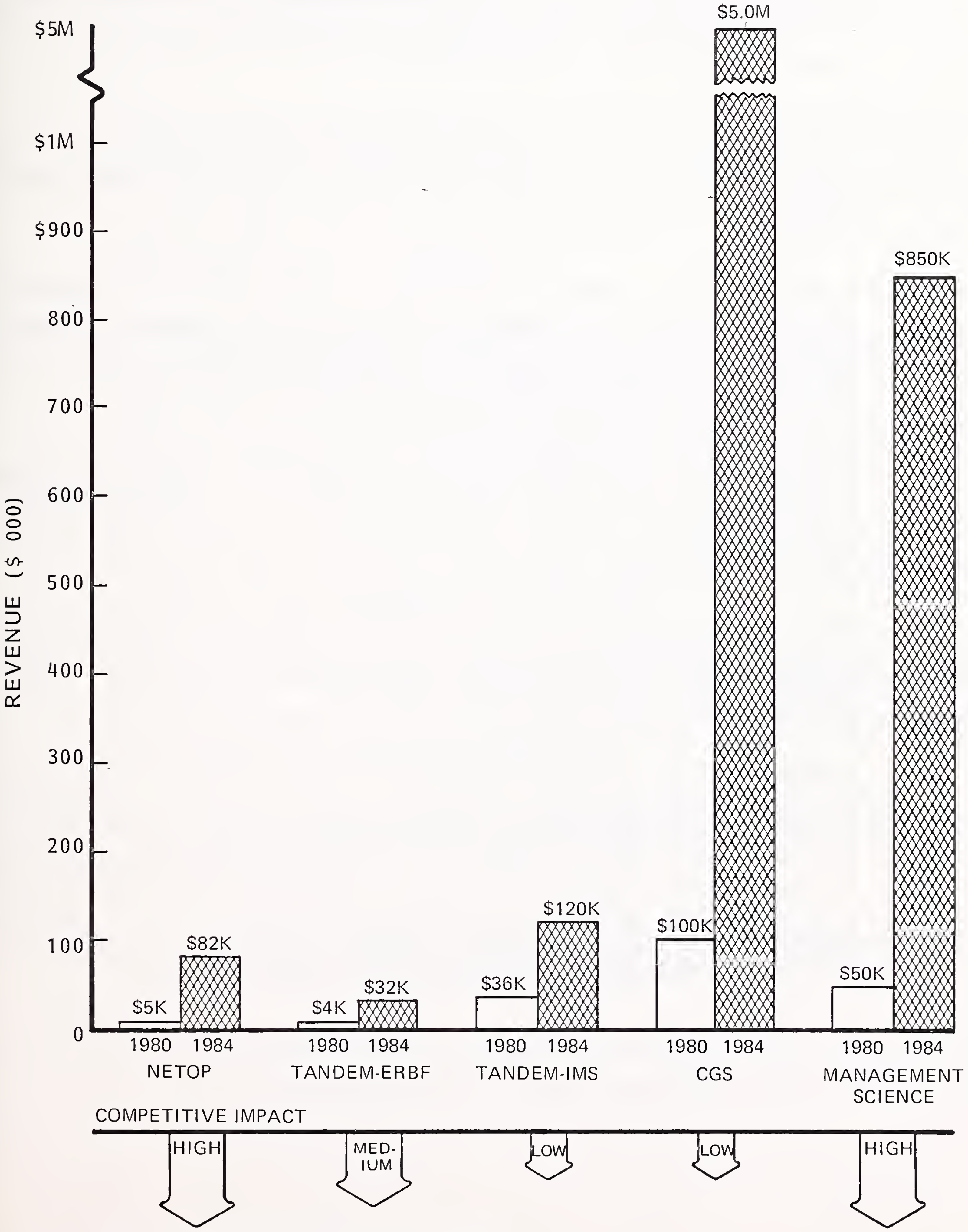
- None of the products analyzed offer large revenue potential for 1980. Revenue opportunity estimates range from $4,000 for Tandem ERBF to $100,000 for the computerized graphics service.

- These revenue estimates are low primarily due to the time required to get a new business started. A great deal of work needs to be done to launch any of the products discussed. Since GD has not been active in any of these markets, it will take time to establish market awareness.

- Computerized graphics services has the largest long term revenue ($5,000,000 annually by 1984). Management science consulting is second with $850,000. Tandem-IMS has a GD revenue potential of $120,000 for 1984, while Tandem-ERBF is $32,000 for the same period. NETOP yields $82,000 for 1984.

EXHIBIT VIII-2

COMPARATIVE GD ANNUAL PRODUCT REVENUES (1980, 1984)



CGS = COMPUTERIZED GRAPHICS SERVICE
K = $ 000
M = $ 000,000

D. COMPETITION

- The lower portion of Exhibit VIII-2 shows the relative degree of competition in each of these markets. Arrows are shown pointing downward to emphasize its potential negative impact of GD revenue.

- NETOP has low market and revenue potential for 1980 and 1984 and, at the same time, faces very significant competition in the form of IBM's NCCF package.

- Tandem ERBF has moderate competition in the form of Tandem Computer's software package. It is unknown at this time how aggressively Tandem Computers will compete in this area in the future. Currently, they do not view software package marketing as a major thrust.

- Tandem-IMS has very little competition currently. Tandem Computer's competing product is costly to implement due to the requirement to change application programs.

- Computerized graphics service also has little competition in the local market. This competition is likely to increase significantly in the next several years, however.

- Management science consulting currently has a great deal of competition. This competitive environment will continue to be difficult over the next five years due to the variety, prestige, and volume of suppliers in the marketplace. The competitive pressure in this market is viewed by INPUT as a major deterent in spite of the size of the revenue potential. The competitive pressure increases the risk associated with any venture in this area.

E. ADDITIONAL CONSIDERATIONS

- Exhibit VIII-3 compares the products based on additional financial criteria, fit to GD skills, and market considerations.

- Revenues for all products increase significantly for 1981 as compared to 1980. Revenue for these products is typically five to ten times as great as 1980, the first year of marketing. For 1981 computerized graphics services continues to have the largest revenue opportunity ($1,000,000). Next largest is management science consulting at $250,000.

- It is INPUT's experience that new products of the type analyzed for this project rarely achieve a profit in the second year in excess of 10%. In many cases, vendors are very happy just to break even. For this report, a second year profit margin of 10% is used to illustrate what INPUT considers an "upper limit."

- Using the above assumption, profit margins range from a low of $3,000 (for NETOP) to a high of $100,000 for CGS for 1981.

- By 1984 the top profit figure (also assumed to be 10% of revenues) is $500,000 for CGS. Management science consulting follows with $85,000. The remaining three products show profits at $12,000 or less.

- From a financial point of view, the five products in Exhibit VIII-3 fall into three distinct levels.

  - CGS is in the top level. Its revenue and profit margins are four or more times greater than the next highest product.

  - Management science consulting is in the second tier with financial estimates averaging two or more times greater than the remaining products.

EXHIBIT VIII-3

COMPARATIVE PRODUCT ANALYSIS

ROW #	CRITERIA		NETOP	TANDEM-ERBF	TANDEM-IMS	COMPUTERIZED GRAPHICS SERVICE	MANAGEMENT SCIENCE CONSULTING
A.	GD REVENUE (ANNUAL) ($000)	1980	$ 5	$ 4	$ 36	$ 100	$ 50
		1981	31	36	156	1,000	250
		1984	82	32	120	5,000	850
B.	GD PROFIT (ANNUAL) ① ($000)	1981	$ 3	$ 4	$ 16	$ 100	$ 25
		1984	8	3	12	500	85
C.	FIT TO GD STRATEGIC DIRECTIONS AND STRENGTHS ②		FAIR TO GOOD	FAIR TO GOOD	FAIR TO GOOD	VERY GOOD	FAIR TO GOOD
D.	OTHER CONSIDERATIONS			GROWTH DEPENDS ON TANDEM COMPUTER SALES	GROWTH DEPENDS ON TANDEM COMPUTER SALES	ACQUISITION POTENTIAL	LABOR INTENSIVE

① AT 10% OF REVENUE

② AS A MANUFACTURER OF LOW VOLUME, HIGH TECHNOLOGY PRODUCTS, SKILLED IN COMPUTER BASED TOOLS AND METHODS

  - The final three products (Tandem-IMS, Tandem ERBF, and NETOP) fall in the lower tier with revenues and profits significantly lower than Management science consulting.

- New products have a greater chance of success if they are consistent with the vendor's strategic directions and strengths. In GD's case, this means that the closer the fit of the products to GD's expertise as a manufacturer of low volume, high technology products, and as a company skilled in the development and application of computer based tools and methods, the greater the likelihood that desired goals will be reached.

  - There is some variance between the products in regards to this criteria. As shown in Exhibit VIII-3, in INPUT's opinion CGS has the closest fit. This is because the CAD based process itself is close to the heart of GD's strengths and future direction.

  - The fit of the remaining products is considered "fair to good." Management science consulting addresses manufacturing and support activities directly, but is not computer based to the extent a product exists to be sold along with the consulting.

  - The three systems software products are not manufacturing application products since they make the computer site more efficient in any environment. Thus, GD's unique skills as a manufacturer are not being directly used, although GD skills in the data processing area are involved.

F. OTHER PRODUCTS

- INPUT also recommends that GD further analyze two other product areas which came to our attention during this study:

- Large non-IBM mainframe access to IMS data bases: As discussed in Section VII, the ability to access large data bases from CDC or other large non-IBM mainframes may be an interesting opportunity.

- Computer Workload Forecasting Model: INPUT's activities around the country bring us continually in contact with top computer executives of large sites. Quite often we hear these managers express a serious concern that they cannot effectively forecast the capacity requirements of their computers sufficiently far enough in advance to optimize hardware, software, and personnel expenditures. If GD's computer workload forecasting model is sufficiently generalized that it may be usable by other firms, INPUT recommends that it be investigated as a potential product opportunity, either as a service or as a software product.

- Whenever GD gives thought to additional product candidates, special attention should be given to those that match needs identified in Section VII (Unmet Manufacturing Systems Needs), namely: people cost control, inventory management, robotics, and numerical control. GD currently has a great deal of unique expertise in these areas.

- INPUT was especially impressed with the significant enhancements made in the robotics area by GD personnel. While such tools help make GD more productive internally and hence more competitive, GD could gain a great deal of additional knowledge by marketing such products externally. This knowledge can continuously be fed back into internal applications. If GD declines to enter the market with unique tools such as robotics, someone else will. That vendor will gain both the knowledge and the revenue that could have been available to GD.

- Regardless of which product(s) GD may select to pursue further, success in the computer software and services marketplace requires all of the following:

- Commitment to the business as a full-time activity: Entering a new marketplace is too challenging to be considered a part-time job. To the external customer it must, at all times, look like a full-time long-term commitment by the supplier. Internally, those responsible for making the business a success must be given a full-time opportunity to make it happen.

- Emphasis on marketing: All decisions regarding the strategies of the business must be made from a "what the market wants" point of view. Major resources must be invested in personnel experienced in both marketing and sales in the computer services and/or software marketplace.

APPENDIX A: INTERVIEW PROGRAM

APPENDIX A: INTERVIEW PROGRAM

- A total of 50 interviews were completed for this project (10 on-site and 40 telephone).

- Exhibit A-1 summarizes the number and type of interviews by product category. Based on results received after approximately one-third of the interviews had been completed, the interview distribution was modified from initial objectives.

- Respondents were informed that neither their name nor their firm's name would be identified with their replies. In addition, they were told that in exchange for their participation in this survey a special summary of the results would be sent to them.

EXHIBIT A-1

INTERVIEW SUMMARY

PRODUCT	TYPE OF INTERVIEW						
	MARKET PHONE	MARKET ON-SITE	TOTAL MARKET	VENDOR PHONE	VENDOR ON-SITE	TOTAL VENDOR	TOTAL ALL
COMPUTERIZED GRAPHICS SERVICES	8	3	11	2	0	2	13
MANAGEMENT SCIENCE CONSULTING	12	0	12	0	1	1	13
NETWORK OPERATOR SOFTWARE	0	4	4	0	0	0	4
TANDEM SYSTEMS SOFTWARE	5	2	7	0	0	0	7
UNMET MANUFACTURING SYSTEMS NEEDS	13	0	13	0	0	0	13
TOTAL	38	9	47	2	1	3	50

APPENDIX B: DEFINITIONS

APPENDIX B: DEFINITIONS

- Computerized Graphics Service: This is a service which offers computer-aided design (CAD) hardware, software and personnel for completion of work submitted by external clients. Based on GD's existing resources, such a service might provide CADAM and/or Computervision capabilities. Clients of this service receive the benefits of automated drawing production without the need of investing in equipment and operators.

- Management Science Consulting: This is a service which provides skilled specialists to outside firms on a project basis. These individuals are experts in the application of sophisticated analytical methods to complex business problems. GD's management science personnel possess skills in such areas as statistical analysis, financial analysis and decision support systems.

- Market Potential: This term means the total amount of money available in a market, assuming all prospects bought the product that were eligible to do so.

- Network Operator Software (NETOP): This software package is a GD developed systems software program that allows a computer operator to control a complete VTAM network from a single terminal. Advantages of NETOP include the reduction of personnel needed to manage such a network, and a reduction in the time required to recover from certain network problems.

- Network Programmed Operator (NPO): This is generic term to represent any type of software program which performs functions similar to NETOP.

- Revenue Potential: This term means revenue that is available to GD, assuming a given percentage of the Market Potential is sold.

- Tandem Systems Software: Three GD developed systems software programs were considered. They are:

  - Tandem-IMS Interface (Tandem-IMS): This program allows Tandem application programs to communicate with IBM IMS application programs. It requires no modification to IMS programs and supports COBOL, FORTRAN and TAL.

  - Tandem Enhanced Remote Batch Facility (Tandem ERBF): This program, if developed by GD, would replace Tandem Computer's existing 2780/3780 emulator. It would be designed to use communication lines more efficiently, be faster, offer console support and support multiple users.

  - Audio-Response Unit Interface: This software, if developed by GD, would allow an audio-response unit to be attached to a Tandem computer.

  - All of the above Tandem systems software programs can be used by clients to enhance their investment in Tandem computers by either helping to integrate Tandem with existing mainframe resources, and/or expanding Tandem's capabilities into additional application areas.

APPENDIX C: MARKET QUESTIONNAIRE: COMPUTERIZED GRAPHICS SERVICE

CATALOG NO. YGDIG

COMMERCIAL PRODUCT OPPORTUNITIES SURVEY
(Computerized Graphics Services-Market)

1. Does your company do design work which involves the creation of drawings and blueprints?

YES _____

NO _____ (If "NO", end interview)

2. Approximately how many design engineers and draftsmen does your company employ?

____

3a. Does the number of design engineers and draftsmen in your company fluctuate by 20% or more during a 12-month period?

YES _____

If "YES"

3b. What causes these fluctuations? _______________

____

____

____

NO _____

4. Listed below are several characteristics of drawings and blueprints. Please indicate to what extent these characteristics apply to your company's drawings.

	OFTEN	SOMETIMES	NEVER	DON'T KNOW
a. Are drawn very close to scale	_____	_____	_____	_____
b. Include standard components	_____	_____	_____	_____
c. Are very complex	_____	_____	_____	_____
d. Are modifications to existing drawings	_____	_____	_____	_____
e. Require much hand lettering	_____	_____	_____	_____
f. Incorporate U.S. military standards	_____	_____	_____	_____

4. (continued)

	OFTEN	SOMETIMES	NEVER	DON'T KNOW
g. Produced in 3 dimensions	_____	_____	_____	_____
h. Other important characteristics (Specify)				
______________________________	_____	_____	_____	_____
______________________________	_____	_____	_____	_____

5. Approximately how many drawings does your company produce in an average 30-day period? ______________________________

____

6. Is the number of drawings produced per month likely to increase or decrease in the next 12 months?

YES _____

If "YES"

6a. By what percentage?

% increase ________

% decrease ________

6b. What is the main cause of this change in volume? ______________________________

____

____

NO _____

7. Are these drawings used as input to some other system or process?

YES _____

If "YES", give example of such systems or processes

____

____

____

____

NO _____

8. Are you familiar with computerized graphics systems which allow a designer or draftsman to produce drawings with the help of a computer?

YES _____

NO ______ (Read Definition, then go to Question #33.)

9. Has your company ever seriously considered the usage of such a system?

YES _____ (When?_________________)

NO ______ (Go to Question #33.)

10. Is your company currently using a computerized graphics system?

YES _____

NO ______ (Go to Question #33.)

11a. Has your company leased or purchased the necessary hardward and software?

YES _____

If "YES", 11b. Who is the vendor(s)? ____________________

11c. What model? ______________________________

11d. Approximate purchase price. ______________

11e. How many systems do you have? ____________

11f. What applications do you use it for? ______

____

____

11g. When did you first acquire the system(s)?

____

11h. Is your usage of this equipment increasing or decreasing? Why? ____________________

____

NO _____

12. Is your company using any computerized graphics systems on a service basis? (i.e., a vendor provides the usage of the equipment as a service to several customers)

YES _____

NO _____ (Go to Question #33.)

13. What applications and types of drawings are you using it for? ____________

____

____

____

14. When did you first begin using this service? ________________________

15. Who is the vendor for this service? (Name and location) _______________

____

16. What does the vendor supply with this service?

TERMINAL HARDWARE __________

HOST COMPUTER ______________

PERSONNEL TO USE THE EQUIPMENT _____________

TRAINING ________________

CONSULTING (Specify functions performed) ________________________

____

OTHER (Specify) ____

17. Approximately what does your company spend per month to use this service?

____

18. What does this expenditure include? ____________________

____

19. How many drawings per month do you produce for this expenditure? ________

____

20. How is the service priced? ________________________

____

____

____

21. During 1980, is your company's usage of this service likely to increase or decrease?

YES _____

If "YES", specify expected percentage change over 1979

% Increase _____ or % Decrease _____

What factors will cause this change? ________________

____

____

____

____

NO _____

CATALOG NO. Y G D I G

22. What are the main benefits of this service to your company? ____________

23. What types of vendor and/or internal problems have you encountered to date with the service? ____________

24. Are you aware of any other vendors which offer computerized graphics services?

YES _____

If "YES", Who? (Name and Location) ____________

NO _____

25. What was the main reason your company elected to use your current service vendor rather than some other supplier? ____________

26. How did your company justify the cost of such a service? ______________

____

____

____

____

27. What objections or concerns were encountered from within your company prior to first usage of the service?

____

____

____

____

____

28. Who, by job title, evaluated the service? ____________________________

29. Who, by job title, made the final decision to buy? ____________________

30. What additional capabilities would your company like to see in such a service, which are not currently offered? Why?

____

____

____

____

31. All things considered, how would you rate your company's satisfaction with the service?

VERY SATISFIED ________________ VERY DISAPPOINTED ________________

SOMEWHAT SATISFIED ____________ DON'T KNOW ______________________

SOMEWHAT DISAPPOINTED _________

WHY? ______________________________

32. When your current contract expires for this service, how likely is it that you will renew with your current vendor? Why?

(GO TO QUESTION #37.)

---

33. Vendors who provide computerized graphics claim to provide a number of benefits to their customers. Please rank the following benefits in terms of their appeal to the decision-makers within your company.

("1" = most important, "2" = next most important, etc.)

_____ Improves design personnel productivity by relieving them of drafting tasks.

_____ Speeds up turnaround of drawings.

_____ Provides high quality drawings at lower cost.

_____ Reduces severity of shortage of design personnel.

34. Are there any other benefits, not listed above, which such a system might provide to your company? Please specify.

35. What concerns or objections might your firm have to the usage of a

- computerized graphic system?

____

____

____

- computerized graphic service?

____

____

____

36. All things considered, how would you rate your firm's interest in computerized graphics services?

MUCH INTEREST ________ LITTLE INTEREST ________

SOME INTEREST ________ NO INTEREST ________

Why? ______________________________

____

____

____

---

37. What other comments or observations would you like to make?

____

____

____

____

____

____

____

____

____

38. Do you know of any other firms which use, or are considering the usage of a computerized design graphics service? (Name and Location)

____

____

____

39. Do you know of any vendors of computerized graphics services? (Name and Location)

____

____

____

____

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX D: VENDOR QUESTIONNAIRE: COMPUTERIZED GRAPHICS SERVICE

CATALOG NO. Y G D I G 5

COMMERCIAL PRODUCT OPPORTUNITIES
(Computerized Graphics Services-Vendor)

1. What type of computerized graphics services does your firm offer? (Hardware, support personnel, etc.)

2. How long have you been offering this service? ______

3. Why did you elect to begin offering this service? ______

4. What size and types of customers do you serve? ______

5. What types of drawings do they produce with your service? ____________________

6. What customers can you cite as references? (Name, location, person to contact)

7. How is your service priced? ____________________

8. Approximately how much would an average customer spend for your service?

9. What advantages does your service provide to a customer? ____________________

10. Why would a customer select your firm rather than a competitor? ____________

11. What firms do you most often compete against? ____________

12. What is your primary indirect competition? Why? ____________

13. Approximately how many customers have used your service to date?

14. Approximately how much business did you do in computerized graphics services in 1979?

15. What percentage change do you anticipate for 1980? ____________

16. What percentage growth (if any) do you anticipate over the next 5 years?

17. What are the primary forces contributing to this 5 year outlook? (Both positive and negative.)

18. What types of customers offer the greatest growth potential over the next several years?

19. What is the biggest challenge regarding the marketing of engineering graphics services? Why?

20. What types of objections do you most frequently hear? ____________________

____

____

____

____

____

____

____

____

____

21. Does your company use computerized graphics services for internal work?

YES _____

If "YES", what type of problems are encountered when you attempt to market a service for which you have internal needs? ________________________________

____

____

____

____

____

____

____

____

____

NO _____

22. What other comments and observations would you like to make? ______________

23. Do you know of any other firms which might be interested in participating in this survey? (Names and locations) ______________

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX E: MARKET QUESTIONNAIRE: TANDEM SYSTEMS SCIENCE CONSULTING

CATALOG NO. Y G D I T

COMMERCIAL PRODUCT OPPORTUNITIES
(Tandem)

1a. Does your company have one or more Tandem computer systems installed?

YES ____

If "YES",

LOCATION	# TANDEM SYSTEMS	HAVE "ENSCRIBE"?	HAVE "ENVOY"?
____	____	____	____
____	____	____	____
____	____	____	

NO____(If "NO", end interview)

1b. Is it likely you will get any additional Tandem computer systems in 1980?

YES____(If "YES", how many?________) NO______

2. What size and type of large scale mainframe computers does your company have installed (equivalent to IBM 158 or larger)?

MANUFACTURER	MODEL	QUANTITY
____	____	____
____	____	____
____	____	____
____	____	____

3. Does your company have IMS installed?

YES ______

If "YES", what version? ________________

NO ______

4. Do you have IRSS (Intelligent Remote Station Support) installed with IMS?

YES _____ NO _____

5. Does your firm have a software or hardware capability which allows Tandem application programs to communicate interactively with IMS programs?

YES _____

If "YES", who supplied the system that allows this communication to occur?

____

NO _____

Please answer the following questions assuming that a software package was made available which enabled your Tandem application programs to communicate with IMS programs. Assume further that this package had the following key features:

(1) Requires no IMS modifications

(2) Supports COBOL, FORTRAN and TAL programs

(3) Allows up to 16 applications to communicate with IMS at once

(4) Queues messages for later forwarding (if IMS or application is not available)

6. To what extent might your firm be interested in using such a product?

MUCH INTEREST _________ LITTLE INTEREST _____ DON'T KNOW_______

SOME INTEREST _______ NO INTEREST _______(why not?____________________

____

If "NO INTEREST", go to Question #16)

7. What factors affect your company's interest in this product? Why?

____

____

____

____

____

8. If such a product were currently available, at what point in time would your firm consider evaluating it?

IMMEDIATELY ________ WITHIN 12 MONTHS______

WITHIN 6 MONTHS______ NEVER_______________ DON'T KNOW ______

9. If your firm decided to examine such a product, what would be the main evaluation criteria?

____

____

____

____

____

____

10. Who, by job title would.....

- Evaluate this product? ____________________________________

- Make the final decision regarding acquisition? ____________________

____

11. What concerns or objections might people in your firm have regarding the usage of this product?

____

____

____

____

____

____

____

12. Are you aware of any other product on the market which also allows Tandem applications to communicate with IMS?

YES _____

If "YES", What is the name of the method and its vendor?

____

NO _____

13. Are there any major features of this product which I did not mention, but which your firm might consider to be important to a decision to buy?

YES _____

If "YES", what are they? ____________________________

____

____

____

____

____

NO _____

14. What would your firm expect to pay a vendor in order to use a product with the features described earlier? (Total price for unlimited usage on all Tandem computer systems within your company.)

____

Why? ____

15. What would you estimate it would cost your company to internally develop a Tandem to IMS capability. ______________________________

---

16. To what extent might your firm be interested in an Enhanced Remote Batch Capability from Tandem to IBM mainframes?

This proposed product would replace Tandem's existing 2780/3780 emulator, which has very limited capabilities.

This new product would:

(1)Use communication lines more efficiently

(2)Be faster

(3)Offer console support

(4)Support multiple users

MUCH INTEREST _____

NO INTEREST _____(Why?________________

SOME INTEREST _____

____

LITTLE INTEREST _____

(If "NO INTEREST, go to Quest.

DON'T KNOW______

17. What factors influence your company's interest in this proposed capability?

____

____

____

____

____

18. If such a product were currently available, at what point in time might your firm consider evaluating such a product?

IMMEDIATELY__________

WITHIN 12 MONTHS______

WITHIN 6 MONTHS______

NEVER_________________

DON'T KNOW_____

19. What would your firm expect to pay a vendor in order to use a product with the features described earlier? (Total price for unlimited usage on all Tandem computer systems within your company.) ______________________________

Why? ______________________________

20. To what extent would your firm be interested in s software package that would allow an audio-response unit to be interfaced to a Tandem computer?

MUCH INTEREST ______ LITTLE INTEREST ______ DON'T KNOW ____

SOME INTEREST ______ NO INTEREST ______

21. What factors influence your company's interest in this capability? ______

CATALOG NO. Y G D I T

22. What would your firm expect to pay a vendor in order to use a product with the features described earlier: (Total price for unlimited usage on all Tandem computer systems within your company.)

____

Why? ____________________

23. If such a capability were currently available, at what point in time might your firm consider evaluating such a product?

IMMEDIATELY __________ WITHIN 12 MONTHS __________

WITHIN 6 MONTHS ______ NEVER __________ DON'T KNOW ______

24. What other comments and observations concerning any of the above topics would you like to make?

24. Other comments and observations (continued)

25. Do you know of any other firms which use both Tandem and IBM computers?
(Name and Location) ______

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX F: MARKET QUESTIONNAIRE: MANAGEMENT SCIENCE CONSULTING

CATALOG NO. YGDIM

COMMERCIAL PRODUCT OPPORTUNITIES
(Management Science)

1. To what extent does your company perform any of the following analytical activities? (Check all that apply.)

	USAGE TO DATE				CONSIDERING DURING 1980?		
	Often	Sometimes	None	Don't Know	Yes	No	Don't Know
a. Complex statistical or financial analysis?	____	____	____	____	____	____	____
b. Modeling or simulation?	____	____	____	____	____	____	____
c. Complex cost or return-on-investment analysis?	____	____	____	____	____	____	____
d. Any other activities classified as "management science" or "operations research" (Specify)							
________	____	____	____	____	____	____	____
________	____	____	____	____	____	____	____
________	____	____	____	____	____	____	____
________	____	____	____	____	____	____	____

2. Assuming effective, experienced management science consultants were available as consultants in your area, how likely is it that your firm might seriously consider using such a resource within the next 12 months?

VERY LIKELY ______ NOT LIKELY ______

SOMEWHAT LIKELY ______ DON'T KNOW ______

Why? ______

If "HIGHLY LIKELY" or "SOMEWHAT LIKELY", approximately how many man-months of such consulting work might your firm consider contracting for in the next 12 months?

______

3. What factors might contribute to the likelihood that your firm would use external management science consultants in the next 12 months?

______

(If Questions #1. a, b, c, and d are all answered "None" and "No" end the the interview at this point.)

CATALOG NO. Y G D I M

4. Does your firm have one or more employees who perform analytical activities such as mentioned in Question #1 above?

YES _____

If "YES", how many employees perform such activities....

.....on a full-time basis? _______________

.....on a part-time basis? _______________

Do you anticipate expanding this staff during 1980?

YES_____(How much? _____% increase) NO _____

NO ______

5. Has your firm ever used outside consultants to perform analytical tasks such as mentioned in Question #1 above?

YES_____

If "YES", number of man-months of consulting contracted during 1979?

_____________ In past 3 years _______________

What vendor(s) performed these services? _________

____

What applications did they work on? ______________

____

____

____

5. Use of outside consultants (continued)

Overall, was your firm satisfied with the performance of these outside consultants?

YES______ NO______

Why or why not? ______________________________

NO______

6. Based on your knowledge, are good management science consultants....

EASY TO FIND______ DIFFICULT TO FIND______ DON'T KNOW_______

Why? ____

7. Are you aware of any vendors who offer management science consultants in your metropolitan area?

YES______

If "YES", vendor names and location _______________________

NO _____

8. If your firm decided to consider the use of outside management science consultants, by what criteria would you evaluate potential vendors?

9. Who, by job title, would...

- Evaluate consultant candidates?
- Make the final decision to contract?

10. What concerns or objections might people in your firm have regarding usage of external management science consultants?

11. On a "per hour" basis, how much might your firm expect to pay for a management science consultant?

12. At what point in time might your firm be interested in considering a management science consultant?

IMMEDIATELY ________ WITHIN 12 MONTHS ________

WITHIN 6 MONTHS______ NEVER ________________ DON'T KNOW ______

13. What other comments or observations would you like to make?

____

____

____

____

____

____

____

____

____

____

____

14. Do you know of any other firms that use management science personnel on either an in-house or consultant basis?

Names and locations ____

____

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX G: MARKET QUESTIONNAIRE: NETWORK OPERATOR SOFTWARE

CATALOG NO. Y G D I N

COMMERCIAL PRODUCT OPPORTUNITIES
(NetOp Software)

1a. Does your company have (or is it in the process of setting up) a complex VTAM network?

YES _____

If "YES",

1b. Number and type of large scale IBM (or equivalent) mainframes involved (158 size of larger).

MODEL	QUANTITY
_____	________
_____	________
_____	________
_____	________

1c. Number of terminals supported?

____

1d. Number of IBM 3705's used?

____

1e. Is this network for multi-applications?

YES ______ NO ______

NO ______

2. Does your company have installed.....

IMS?	YES _____	NO _____
CICS?	YES _____	NO _____

3a. Is your firm using any type of network "programmed operator" software package with VTAM? (Read Definition if respondent not familiar with this term)

YES _____

If "YES",

3b. Name of package? ____________________

3c. Vendor Name ____________________

3d. When installed? ____________________

3e. Cost? ____________________

3f. Main advantage of product? ____________________

____

____

____

3g. Main disadvantage of product? ____________________

____

____

____

3h. Overall satisfaction with the product:

HIGHLY SATISFIED ________

SATISFIED ________

NOT SATISFIED ________

3i. If "NOT SATISFIED", why not? ______

____

____

____

NO_____

3. Continued

If "NO",

3j. Has your company evaluated any software of this type?

YES _____

If "YES",

3k. When? _______________

3l. Outcome of evaluation

____

____

____

____

____

NO _____

Please answer the following questions assuming that a software package was available which performed network "programmed operator" functions such as the following:

a. Can control the entire network from one or more terminals

b. Allows IMS and/or CICS control through the network operator terminal

c. Allows control over single or multiple VTAM computers

d. Performs automatic error recovery procedures as defined by each installation.

4. Are you aware of any software products on the market today which perform these functions?

YES _____

If "YES", name of product and vendor ____________________

____

NO _____

5. Two advantages claimed for network programmed operators of this type are:

a. Reduces personnel needed to manage the network

b. Reduces time needed to recover from certain network problems

To what extent might your firm be interested in using such a product?

MUCH INTEREST______ LITTLE INTEREST ______

SOME INTEREST______ NO INTEREST ______ DON'T KNOW ______

6,7. What factors influence your company's interest in such a product?

____

____

____

____

____

____

____

____

____

____

____

____

8. If your firm decided to examine such a product, what would be the main evaluation criteria?

9. Who, by job title, would....

   - Evaluate this product? ____________________
   - Make the final decision regarding acquisition? ____________________

10. What concerns or objections might people in your firm have regarding the usage of this product?

CATALOG NO. Y G D I N

11. What would your firm expect to pay for using such a product? (Total price for unlimited usage per VTAM system.)

____

Why? ____

____

____

____

____

____

____

____

____

____

____

____

12. At what point in time might your firm be interested in evaluating such a product?

IMMEDIATELY ________ WITHIN 12 MONTHS ________

WITHIN 6 MONTHS _____ NEVER ________________ DON'T KNOW _____

13. What other comments and observations would you like to make?

____

____

____

____

14. Other comments and observations (continued)

15. Do you know of any other firms that might be interestd in (or using) network "programmed operators"?

Names and Locations ______________________________

THANK YOU FOR YOUR TIME.

APPENDIX H: MARKET QUESTIONNAIRE: UNMET MANUFACTURING SYSTEM NEEDS

CATALOG NO. YGDIU

COMMERCIAL PRODUCT OPPORTUNITIES
(Unmet Needs)

1. In comparison with other firms in your industry, to what extent has your company installed automated systems and methods which increase manufacturing productivity?

MORE ____ SAME ____ LESS ____ DON'T KNOW ____

2. What automated systems and methods has your firm installed to date, or are planning to install during 1980?

INSTALLED TO DATE: ____

PLAN TO INSTALL IN 1980: ____

3. What areas of manufacturing offer the greatest potential for productivity improvement, but which your company has not been able to address thus far:

PRIORITY	AREA OF POTENTIAL IMPROVEMENT
____	a. ____
____	b. ____
____	c. ____
____	d. ____
____	e. ____

4. Please rank the areas listed in the preceding question according to "greatest potential for manufacturing productivity improvement." ("1" = highest potential; "2" - next highest potential, etc.)

5. What factors might increase your firm's willingness to install more automated manufacturing systems and methods?

____

____

____

____

____

____

6. Is your firm currently developing any major automated manufacturing productivity systems?

YES ______

If "YES", what application areas are involved? ______________

____

____

____

____

For what reason did your firm elect to develop such a system in-house rather than acquire a package from a vendor?

____

____

____

____

____

NO ______

CATALOG NO. YGDIU

7. What other comments or observations would you like to make?

8. Do you know of any other firms which are concerned about major unmet needs in the manufacturing productivity area?

Names and locations

THANK YOU VERY MUCH FOR YOUR TIME

COMMERCIAL PRODUCT OPPORTUNITIES

ABSTRACT

This report analyses the commercial marketability of several data processing related products available from General Dynamics' Central Data Systems Center (CDSC) at Ft. Worth, Texas.

Of the products investigated, the Computerized Graphics Service offers the most attractive market opportunity. The market is large, growing rapidly, and offers little local competition. The service best leverages GD's strengths and strategic focus.

None of the four systems software products analyzed (Tandem-IMS Interface, Tandem Enhanced Remote Batch Facility, Tandem Audio-Response Interface, and Network Operator Software) is recommended for marketing by GD. Although interest in these products is good, the overall market is too small and costly to enter. Tandem-IMS Interface has sufficient financial potential, however, for GD to consider licensing an established software products vendor to market it on a royalty basis.

Management science consulting is a growth market. However, INPUT recommends General Dynamics not market this service unless a software support and/or proprietary data base capability can be added. Competition is extensive, much marketing is required, and profit margins are too thin for a purely manpower offering.

Major unmet needs identified in the manufacturing area include: inventory management, improvement of worker productivity, and robotics.

Regardless of which products are chosen, two key factors which General Dynamics must apply to be successful in today's highly competitive marketplace are: (1) commitment to the business on a full-time basis, and (2) strong emphasis on marketing.